

CRPL-F156 PART B

FOR OFFICIAL USE

PART B

SOLAR - GEOPHYSICAL DATA

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CENTRAL RADIO PROPAGATION LABORATORY  
BOULDER, COLORADO



## SOLAR - GEOPHYSICAL DATA

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# SOLAR - GEOPHYSICAL DATA

## INTRODUCTION

This monthly report series is intended to keep research workers abreast of the major particulars of solar activity and the associated ionospheric, radio propagation and other geophysical effects. It is made possible through the cooperation of many observatories, laboratories and agencies as recorded in the detailed description of the tables and graphs which follows. The report is edited by Miss J. V. Lincoln of the Sun-Earth Relationships Section.

### I DAILY SOLAR INDICES

Relative Sunspot Numbers -- The table includes (1) the daily American relative sunspot numbers,  $R_A'$ , as compiled by the Solar Division of the American Association of Variable Star Observers, and (2) the provisional daily Zürich relative sunspot numbers,  $R_Z$ , as communicated by the Swiss Federal Observatory. Because of the time required to collect and reduce the observations,  $R_A'$  will normally appear one month later than  $R_Z$ .

The relative sunspot number is an index of the activity of the entire visible disk. It is determined each day without reference to preceding days. Each isolated cluster of sunspots is termed a sunspot group and it may consist of one or a large number of distinct spots whose size can range from 10 or more square degrees of the solar surface down to the limit of resolution (e.g. 1/8 square degrees). The relative sunspot number is defined as  $R=K(10g+s)$ , where  $g$  is the number of sunspot groups and  $s$  is the total number of distinct spots. The scale factor  $K$  (usually less than unity) depends on the observer and is intended to effect the conversion to the scale originated by Wolf. The observations for sunspot numbers are made by a rather small group of extraordinarily faithful observers, many of them amateurs, each with many years of experience. The counts are made visually with small, suitably protected telescopes.

Final values of  $R_Z$  appear in the IAU Quarterly Bulletin on Solar Activity, the Journal of Geophysical Research and elsewhere. They usually differ slightly from the provisional values. The American numbers,  $R_A'$ , are not revised.

Solar Flux Values, 2800 Mc -- The table also lists the daily values of solar flux at 2800 Mc recorded in watts/ $M^2$ /cycle/second bandwidth ( $\times 10^{-22}$ ) in two polarizations by the National Research Council at Ottawa, Canada. These solar radio noise indices are being published in accordance with CCIR Report 25 that a basic solar index for ionospheric propagation should be measured objectively and "preferably refer to a property of the sun such as radiation flux which has direct physical relationship to the ionosphere."

Graph of Sunspot Cycle -- The graph illustrates the recent trend of Cycle 19 of the 11-year sunspot cycle and some predictions of the future level of activity. The customary "12-month" smoothed index,  $R$ , is used throughout, the data being final  $R_Z$  numbers except for the current year. Predictions shown are those made for one year after the latest available datum by the method of A. G. McNish and J. V. Lincoln (Trans. Am. Geophys. Union, 30, 673-685, 1949) modified by the use of regression coefficients and mean cycle values recomputed for Cycles 8 through 18. Cycle 19 began April 1954, when the minimum  $R$  of 3.4 was reached.

## II SOLAR CENTERS OF ACTIVITY

Calcium Plage and Sunspot Regions -- The table gives particulars of the centers of activity visible on the solar disk during the preceding month. These are based on estimates made and reported on the day of observation and are therefore of limited reliability.

The table gives the heliographic coordinates of each center (taken as the calcium plage unless two or more significantly and individually active sunspot groups are included in an extended plage) in terms of the Greenwich date of passage of the sun's central meridian (CMP) and the latitude; the serial number of the plage as assigned by McMath-Hulbert Observatory; the serial number of the center in the previous solar rotation, if it is a persisting region; particulars of the plage at CMP: area, central intensity; a summary of the development of the plage during the current transit of the disk, where  $b$  = born on disk,  $l$  = passed to or from invisible hemisphere,  $d$  = died on disk, and  $/$  = increasing,  $-$  = stable,  $\backslash$  = decreasing; and age in solar rotations; particulars of the associated sunspot group, if any, at CMP: area and spot count and the summary of development during the current disk transit, similar to the above. The unit of area is a millionth of the area of a solar hemisphere; the central intensity of calcium plages is roughly estimated on a scale of 1 = faint to 5 = very bright.

Calcium plage data are available through the cooperation of the McMath-Hulbert Observatory of the University of Michigan and the Mt. Wilson Observatory. The sunspot data are compiled from reports from the U. S. Naval Observatory, Mt. Wilson Observatory, and from reports from Europe and Japan received through the daily Ursigram messages.

Coronal Line Emission Indices -- In the table are summarized solar coronal emission intensity indices for the green (Fe XIV at  $\lambda$ 5303) and red (Fe X at  $\lambda$ 6374) coronal lines. The indices are based on measurements made at  $5^\circ$  intervals around the periphery of the solar disk by the High Altitude Observatory at Climax, Colorado, and by Harvard University observers at Sacramento Peak (The USAF Upper Air Research Observatory at Sunspot, New Mexico, under contract AF 19(604)-146). The measurements are expressed as the number of millionths of

an Angstrom of the continuum of the center of the solar disk (at the same wavelength as the line) that would contain the same energy as the observed coronal line. The indices have the following meanings:

$G_6$  = mean of six highest line intensities in quadrant for  $\lambda 5303$ .

$R_6$  = same for  $\lambda 6374$ .

$G_1$  = highest value of intensity in quadrant, for  $\lambda 5303$ .

$R_1$  = same for  $\lambda 6374$ .

The dates given in the table correspond to the approximate time of CMP of the longitude zone represented by the indices. The actual observations were made for the North East and South East quadrants 7 days before; for the South West and North West quadrants 7 days after the CMP date given.

To obtain rough measures of the integrated emission of the entire solar disk in either of the lines, assuming the coronal changes to be small in a half solar rotation, it is satisfactory to perform the following type of summation given in example for 15 October:

$$(\text{MEAN DISK EMISSION IN } \lambda 5303)_{15 \text{ OCT}} = \frac{1}{N} \left[ \sum_{15 \text{ OCT}}^{22 \text{ OCT}} \left\{ (G_6)_{\text{NE}} + (G_6)_{\text{SE}} \right\} + \sum_{8 \text{ OCT}}^{14 \text{ OCT}} \left\{ (G_6)_{\text{SW}} + (G_6)_{\text{NW}} \right\} \right]$$

where  $N$  is the number of indices entering the summation.

Such integrated disk indices as well as integrated whole-sun indices are computed for each day and are published quarterly in the "Solar Activity Summary" issued by the High Altitude Observatory at Boulder, Colorado. In the same reports are given maps of the intensity distribution of coronal emission derived from all available Climax and Sacramento Peak observations, as well as other information on solar activity, such as maps made from daily limb prominence surveys in  $H\alpha$  and notes regarding the history of active regions on the solar disk.

Preliminary summaries of solar activity, prepared on a fast schedule, are issued Friday of each week from High Altitude Observatory in conjunction with CRPL and include solar activity through the preceding day. These are useful to groups needing information on the current status of activity on the visible solar disk, but are not recommended for research uses unless such a prompt schedule of reporting is essential. The same information is included in the subsequent quarterly reports, with extensive additions, corrections and evaluations.

## III SOLAR FLARES

Optical Observations -- The table presents the preliminary record of solar flares as reported to the CRPL on a rapid schedule at the sacrifice of detailed accuracy. Definitive and complete data are published later in the Quarterly Bulletin on Solar Activity, I.A.U., in various observatory publications and elsewhere. The present listing serves to identify and roughly describe the phenomena observed.

Reporting directly to the CRPL are the following observatories: Mt. Wilson, McMath-Hulbert, U. S. Naval, Wendelstein, Sacramento Peak, Mitaka, and Swedish Astrophysical Station on Capri. The remainder report through the URSIgram centers in Europe. Observations are in the light of the center of the H-alpha line unless noted otherwise. The reports from Sacramento Peak, New Mexico (communicated to CRPL by the High Altitude Observatory at Boulder) are from observations at the USAF Upper Air Research Observatory at Sunspot, New Mexico, by Harvard University observers, under contract AF 19(604)-146.

For each flare are listed the reporting observatory, the date, beginning and ending times, duration (when known), the flare importance on the IAU scale of 1- to 3+, McMath serial number of the region, the heliographic coordinates in degrees, time of maximum phase, total area in millionths of the visible disk (Sacramento Peak uncorrected for foreshortening; other observatories corrected for foreshortening), the fractional area having nearly maximum brightness, and the maximum intensity of the flare. The following symbols are used in the table:

D = Greater than  
E = Less than

F = Approximately  
& = Plus

A final column lists provisionally the occurrence of simultaneous ionospheric effects as observed on selected field-strength recordings of distant high-frequency radio transmissions; a more nearly definitive list of these ionospheric effects, including particulars, appears in these reports after the lapse of a month (see below). All times are Universal Time (UT or GCT). Subflares (importance 1-) are listed by date, time of beginning and their heliographic coordinates.

Ionospheric Effects -- SID (and GID--gradual ionospheric disturbances) may be detected in a number of ways: short wave fadeouts, enhancement of low frequency atmospherics, increases in cosmic absorption, and so forth. The table lists events that have been recognized on field-strength recordings of distant high-frequency radio transmissions. Under a coordinated program, the staffs at the following ionospheric sounding stations contribute reports that are screened and synthesized at CRPL-Boulder: Puerto Rico, Ft. Belvoir, Va., and Anchorage, Alaska (CRPL Stations: PR, BE, AN); Huancayo, Peru, and College, Alaska (CRPL-Associated Laboratories: HU, CO); and White Sands, N. Mex., Adak,

Alaska, and Okinawa (U. S. Signal Corps Stations: WS, AD, OK). McMath-Hulbert Observatory (MC) also contributes such reports. In addition, reports are volunteered by RCA Communications Inc., Marconi Wireless, Netherlands Postal and Telecommunications Services, Swedish Telecommunications, and others; these usually specify times of SID and the radio paths involved.

In the coordinated program, the abnormal fades of field strength not obviously ascribable to other causes, are described as short wave fadeouts with the following further classification:

- S-SWF: sudden drop-out and gradual recovery
- Slow S-SWF: drop-out taking 5 to 15 minutes and gradual recovery
- G-SWF: gradual disturbance; fade irregular in both drop-out and recovery.

When there is agreement among the various reporting stations on the time (UT) of an event, it is accepted as a widespread phenomenon and listed in the table.

The degree of confidence in identifying the event, a subjective estimate, is reported by the stations and this is summarized in an index of certainty that the event is widespread, ranging from 1 (possible) to 5 (definite). The times given in the table for the event are from the report of a station (underlined in table) that identified it with high confidence. The criteria for the subjective importance rating assigned by each station on a scale of 1- to 3+ include amplitude of the fade, duration and confidence; greater consideration is given to reports on paths near the subsolar point in arriving at the summary importance rating given in the table.

Note: The tables of SID observed at Washington included in CRPL F-reports prior to F-135 were restricted to events classed here as S-SWF.

#### IV SOLAR RADIO WAVES

##### 2800 Mc Observations

The data on solar radio wave events made in Ottawa, Canada by the Radio and Electrical Engineering Division of the National Research Council (A. E. Covington) at 2800 Mc (10-cm emission) are presented. Near local noon (about 1700 UT) the sensitivity of the radiometer is determined and a mean flux for the whole day calculated. These values are given in a tabular form (see table I-1) in units of  $10^{-22}$  watts/ $M^2$ /c/s. Burst phenomena are measured above this level and are given in terms especially suitable for the variations

observed on this frequency. The basis for the classifications is described by Covington - J.R. Astro. Soc. Can. 45, 49, 1951 and Dodson, Hedeman and Covington, Ap. J. 119, 541, 1954. A modification in terminology with a view to simplification has been introduced and consists essentially of the omission of the descriptive word "Single" from the "Single-Simple" and "Single-Complex" classes; in designating the "Single", "Single-Simple" and "Rise and Fall" bursts into a single classification designated as "Simple Bursts" with an appropriate type number; in the addition of the letter "f" to indicate that the burst deviates from the basic pattern by the presence of one or more small fluctuations in intensity; and by the addition of the letter "A" to indicate that the event has another smaller duration event superimposed upon it.

#### Simple Burst

Any single burst which rises to one maximum and then decreases to the pre-burst level.

1 - Simple 1 -- Simple burst, type 1 (formerly "single"). Bursts of intensity less than  $7 \frac{1}{2}$  flux units and duration less than  $7 \frac{1}{2}$  minutes.

2 - Simple 2 -- Simple burst, type 2 (formerly "single-simple"). Bursts of impulsive nature with intensity greater than  $7 \frac{1}{2}$  flux units.

3 - Simple 3 -- Simple burst, type 3 (formerly "rise and fall"). Bursts of moderate intensity with duration greater than  $7 \frac{1}{2}$  minutes.

4 - Post-burst increase -- Postburst level is greater than the preburst level. The gradual return to normal flux may require as long as several hours.

#### 5 - Absorption following burst (negative post).

6 - Complex -- (formerly "single-complex"). A single burst which shows two or more comparable maxima before the activity has declined to zero.

7 - Period of irregular activity or fluctuations -- Series of overlapping bursts of moderate intensity and duration.

8 - Group -- Series of single isolated bursts occurring in succession with intensity between the events equal to the level before and after the group.

9 - Precursor -- A small increase of intensity occurring before a larger increase.

### Great Burst

Infrequently occurring bursts of great intensity, often of complicated structure.

### Letter "A"

Indicates that this event has another event superimposed upon it.

### Letter "f"

Indicates that the basic form of the event is modified by secondary fluctuations.

#### CLASS      TYPE

1      SIMPLE 1       RCVR. NOISE

2      SIMPLE 2      

3      SIMPLE 3      

SIMPLE 3A      

4      POST      

POST A      

5      ABSORPTION      

6      COMPLEX      

7      FLUCTUATIONS      

8      GROUP      

9      PRE      

1      START      DURATION

## 200 Mc Observations

Data on solar radio waves made at Cornell University, Ithaca, N.Y. (Marshall Cohen) on 201.5 Mc are presented. All times are in Universal Time (UT or GCT). The half width of the antenna lobe is appreciably greater than the solar disk. The flux reported is that contained in one linear component.

3-hourly Flux -- The mean of the three-hourly flux measurements is given in terms of KTB where the quiet sun level equals 1.40 KTB.

The variability index is as described for 170 Mc and 450 Mc observations.

Outstanding Occurrences -- A separate table lists the outstanding occurrences classified according to the same system as used for 170 Mc and 450 Mc observations.

## 170 Mc and 450 Mc Observations

Data on solar radio emission at the nominal frequencies of 170 Mc and 450 Mc recorded at the Gunbarrel Hill (Boulder) station of the National Bureau of Standards (O. D. Remmler) are presented. The half width of the antenna lobe is appreciably greater than the solar disk. Polarization is not determined, but the dipole is oriented E-W. All times are in Universal Time (UT or GCT).

3-Hourly and Daily Flux Density and Variability -- Flux density is given in power units. These units are approximately  $10^{-22}$  watts meter $^{-2}$ (c/s) $^{-1}$  for both polarizations together. They will be subject to a correction factor when gain measurements of the antenna have been made. The median flux is measured for every one-hour period having at least thirty minutes of usable record and an applicable gain calibration. A three-hour value of flux is obtained by averaging the available one-hour medians (at least two required). A daily value of flux is obtained by averaging all available one-hour medians (at least four required). A blank indicates that insufficient measurements were made to meet the above requirements or that the records were not of usable quality. Flux values may be followed by the qualifying symbols D, S, and X defined subsequently.

The variability index, given for each three-hour interval, is on a scale 0 to 3 defined as follows:

0 - The instantaneous flux did not drop below one-half the median level or exceed twice the median level at any time.

1 - The instantaneous flux made from one to ten excursions

outside the range described above.

2 - The instantaneous flux made from ten to one hundred excursions outside the range described above.

3 - The instantaneous flux made more than one hundred excursions outside the range described above.

For the purpose of the variability index, an excursion whose maximum intensity is  $M$  times the median level is counted as  $M$  excursions. The variability index is omitted if measurements were made for less than one hour during the period. The variability for the day is the mean of the three-hourly values. The letter  $S$  follows variability indices which are in doubt because of atmospherics or local interference.

The observing periods are given in U. T. to the nearest 1/10 hour and they usually extend into the next Greenwich day.

Outstanding Occurrences -- A separate table lists the occurrences which are not adequately described by the three-hourly values of flux density and variability. Two classifications are given: (1) A system in general accord with that described and illustrated by Dodson, Hedeman, and Owren (Ap. J. 118, 169, 1953) and (2) the system described in the IGY Solar Activity Instruction Manual, prepared by the Radio Emission editor of the I.A.U. Quarterly Bulletin on Solar Activity.

In system (1) the occurrences are identified by numbers which do not necessarily indicate the magnitude of the event, as follows:

0 - Rise in base level -- A temporary increase in the continuum with duration of the order of tens of minutes to an hour.

1 - Series of bursts -- Bursts or groups of bursts, occurring intermittently over an interval of time of the order of minutes or hours. Such series of bursts are assigned as distinctive events only when they occur on a smooth record or show as a distinct change in the activity.

2 - Groups of bursts -- A cluster of bursts occurring in an interval of time of the order of minutes.

3 - Minor burst -- A burst of moderate or small amplitude, and duration of the order of one or two minutes.

4 - Minor burst and second part -- A double rise in flux in which the early rise is a minor burst.

6 - Noise storm -- A temporary increase in radiation characterized by numerous closely spaced bursts, by an increase in the continuum, or by both. Duration is of the order of hours or days.

7 - Noise storm begins -- The onset of a noise storm occurs at some time during the observing period.

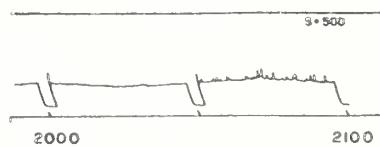
8 - Major burst -- An outburst, or other burst of large amplitude and more than average duration. A major burst is usually complex, with a duration of the order of one to ten minutes.

9A, 9B, or 9 - Major burst and second part or large event without distinct first and second parts -- If there is a double rise in flux, the first part, a major burst, is listed as 9A and the second part as 9B. The second part may consist of a rise in base level, a group or series of bursts, a noise storm. A major increase in flux with duration greater than ten minutes but without distinct first and second parts, is listed simply as 9.

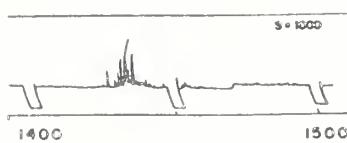
0-RISE IN BASE LEVEL



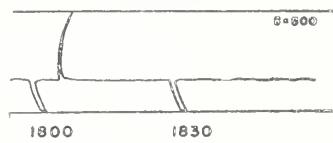
1 - SERIES



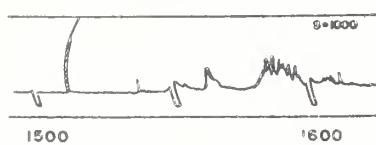
2 - GROUP



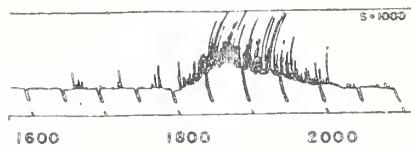
3 - MINOR



4 - MINOR+



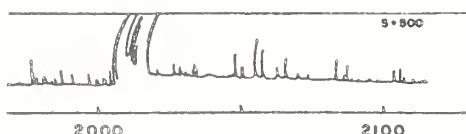
7 - ONSET OF NOISE STORM



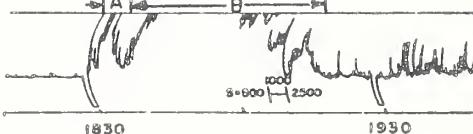
6 - NOISE STORM IN PROGRESS



8 - MAJOR



9 - MAJOR +



In system (2) combinations of the following letters are used to describe some distinctive characteristics of the recorded disturbances:

S = simple rise and fall of intensity,  
 C = complex variation of intensity,  
 A = appears to be part of general activity,  
 D = distinct from (i.e. apparently superimposed upon) the general background,  
 M = multiple peaks separated by relatively long periods of quietness,  
 F = multiple peaks separated by relatively short periods of quietness,  
 E = sudden commencement or rise of activity.

Starting and maximum times are read to the nearest 1/10 minute if they are very definite and otherwise to the nearest minute. If the duration is less than five minutes, it is given to the nearest 1/10 minute; otherwise to the nearest minute (see also qualifying symbols below).

Maximum flux densities are given in units of  $10^{-22}$  watts meter $^{-2}(c/s)^{-1}$ . The instantaneous maximum flux density is the highest peak in the disturbance measured above the sky level. The smoothed maximum flux density is the maximum value of a smooth curve drawn through the outstanding occurrence with a smoothing period of 20 to 50 percent of the total duration; it is measured above the estimated level in the absence of the disturbance. The intention is that (smoothed maximum) x (duration) should give a measure of the energy radiated in the disturbance.

A blank indicates missing or insignificant data. Observations are interrupted during the period from 31 to 34 minutes after each hour for calibrations. Observing periods are given in the Daily Data tables. The following qualifying symbols are used:

B - Event in progress before observations began.  
 D - Greater than...  
 I - Event apparently continued during an interruption of the observations. The period of the interruption may be given in the remarks.  
 N - See footnotes.  
 X - Measurement is uncertain or doubtful.  
 S - Measurement may be influenced by interference or atmospherics.

## V GEOMAGNETIC ACTIVITY INDICES

C, Kp, Ap, and Selected Quiet and Disturbed Days -- The data in the table are: (1) preliminary international character figures, C; (2) geomagnetic planetary three-hour range indices, Kp; (3) daily "equivalent amplitude," Ap; (4) magnetically selected quiet and disturbed days.

This table is made available by the Committee on Characterization of Magnetic Disturbance of IAGA, IUGG. The Meteorological Office, De Bilt, Holland collects the data from magnetic observatories distributed throughout the world, and compiles C and selected days. The Chairman of the Committee computes the planetary and equivalent amplitude indices. The same data are also published quarterly in the Journal of Geophysical Research along with data on sudden commencements (sc) and solar flare effects (sfe).

The C-figure is the arithmetic mean of the subjective classification by all observatories of each day's magnetic activity on a scale of 0 (quiet) to 2 (storm).

Kp is the mean standardized K-index from 12 observatories between geomagnetic latitudes 47 and 63 degrees. The scale is 0 (very quiet) to 9 (extremely disturbed), expressed in thirds of a unit, e.g. 5- is 4 2/3, 5o is 5 0/3, and 5+ is 5 1/3. This planetary index is designed to measure solar particle-radiation by its magnetic effects, specifically to meet the needs of research workers in the ionospheric field. A complete description of Kp has appeared in Bulletin 12b, "Geomagnetic Indices C and K, 1948" of the Association of Terrestrial Magnetism and Electricity (IATME), International Union of Geodesy and Geophysics.

Ap is a daily index of magnetic activity on a linear scale rather than on the quasi-logarithmic scale of the K-indices. It is the average of the eight values of an intermediate 3-hourly index "ap," defined as one-half the average gamma range of the most disturbed of the three force components, in the three-hour interval at standard stations; in practice, ap is computed from the Kp for the 3-hour interval. The extreme range of the scale of Ap is 0 to 400. The method is described in IATME Bulletin No. 12h (for 1953) p. viii f. Values of Ap (like Kp and Cp) have been published for the Polar Year 1932/33 and for the years 1937 onwards.

The magnetically quiet and disturbed days are selected in accordance with the general outline in Terr. Mag. (predecessor to J. Geophys. Res.) 48, pp 219-227, December 1943. The method in current use calls for ranking the days of a month by their geomagnetic activity as determined from the following three criteria with equal weight: (1) the sum of the eight Kp's; (2) the sum of the squares of the eight Kp's; and (3) the greatest Kp.

Chart of K<sub>p</sub> by Solar Rotations -- The graph of K<sub>p</sub> by solar rotations is furnished through the courtesy of Dr. J. Bartels, Geo-physikalisches Institute, Göttingen.

## VI RADIO PROPAGATION QUALITY INDICES

One can take as the definition of a radio propagation quality index: the measure of the efficiency of a medium-powered radio circuit operated under ideal conditions in all respects, except for the variable effect of the ionosphere on the propagation of the transmitted signal. The indices given here are derived from monitoring and circuit performance reports, and are the nearest practical approximation to the ideal index of propagation quality.

Quality indices are usually expressed on a scale that ranges from one to nine. Indices of four or less are generally taken to represent significant disturbance. (Note that for geomagnetic K-indices, disturbance is represented by higher numbers.) The adjectival equivalents of the integral quality indices are as follows:

1 = useless	4 = poor-to-fair	7 = good
2 = very poor	5 = fair	8 = very good
3 = poor	6 = fair-to-good	9 = excellent

CRPL forecasts are expressed on the same scale. The tables summarizing the outcome of forecasts include categories P-Perfect; S-Satisfactory; U-Unsatisfactory; F-Failure. The following conventions apply:

P - forecast quality equal to observed	U - forecast quality two or more grades different from observed when <u>both</u> forecast and observed were > 5, or both < 5
--	--

S - forecast quality one grade different from observed	F - other times when forecast quality two or more grades different from observed
--	--

Full discussion of the reliability of forecasts requires consideration of many factors besides the over-simplified summary given.

The quality figures represent a consensus of experience with radio propagation conditions. Since they are based entirely on monitoring or traffic reports, the reasons for low quality are not necessarily known and may not be limited to ionospheric storminess. For instance, low quality may result from improper frequency usage for the path and time of day. Although, wherever it is reported, frequency usage is included in the rating of reports, it must often

be an assumption that the reports refer to optimum working frequencies. It is more difficult to eliminate from the indices conditions of low quality for reasons such as multipath or interference. These considerations should be taken into account in interpreting research correlations between the Q-figures and solar, auroral, geomagnetic or similar indices.

North Atlantic Radio Path -- The CRPL quality figures, Qa, are compiled by the North Atlantic Radio Warning Service (NARWS), the CRPL forecasting center at Ft. Belvoir, Virginia, from radio traffic data for North Atlantic transmission paths closely approximating New York-to-London. These are reported to CRPL by the Canadian Defense Research Board, Canadian Broadcasting Corporation, and the following agencies of the U. S. Government:--Coast Guard, Navy, Army Signal Corps, U. S. Information Agency. Supplementing these data are CRPL monitoring, direction-finding observations and field-strength measurements of North Atlantic transmissions made at Belvoir.

The original reports are submitted on various scales and for various time intervals. The observations for each 6-hour interval are averaged on the original scale. These 6-hour indices are then adjusted to the 1 to 9 quality-figure scale by a conversion table prepared by comparing the distribution of these indices for at least four months, usually a year, with a master distribution determined from analysis of the reports originally made on the 1 to 9 quality-figure scale. A report whose distribution is the same as the master is thereby converted linearly to the Q-figure scale. The 6-hourly quality figure is the mean of the reports available for that period.

The 6-hourly quality figures are given in this table to the nearest one-third of a unit, e.g. 50 is 5 and 0/3; 5- is 4 and 2/3; 5+ is 5 and 1/3. Other data included are:

(a) Whole-day radio quality indices, which are weighted averages of the four 6-hourly indices, with half weight given to quality grades 5 and 6. This procedure tends to give whole-day indices suitable for comparison with whole-day advance forecasts which seek to designate the days of significant disturbance or unusually quiet conditions.

(b) Short-term forecasts, issued every six hours by the North Atlantic Radio Warning Service. These are issued one hour before 00<sup>h</sup>, 06<sup>h</sup>, 12<sup>h</sup>, 18<sup>h</sup>, UT and are applicable to the period 1 to 7 hours ahead.

(c) Advance forecasts, issued twice weekly by the NARWS (CRPL-J reports) and applicable 1 to 3 or 4 days ahead, 4 or 5 to 7 days ahead, and 8 to 25 days ahead. These forecasts are scored against the whole-day quality indices.

(d) Half-day averages of the geomagnetic K indices measured by the Fredericksburg Magnetic Observatory of the U. S. Coast and Geodetic Survey.

A chart compares the short-term forecasts with Qa-figures. A second chart compares the outcome of advance forecasts (1 to 3 or 4 days ahead) with a type of "blind" forecast. For the latter, the frequency for each quality grade, as determined from the distribution of quality grades in the four most recent months of the current season, is partitioned among the grades observed in the current month in proportion to the frequencies observed in the current month.

Ranges of useful frequencies on the North Atlantic radio path are shown in a series of diagrams, one for each day. The shaded area indicates the range of frequencies for which transmissions of quality 5 or greater were observed. The blacker the diagram, the quieter the day has been; a narrow strip indicates either high LUHF, low MUF, or both. These diagrams are based on data reported to CRPL by the German Post Office through the Fernmeldetechnischen Zentralamt, Darmstadt, Germany, being observations every one and a half hours of selected transmitters located in the eastern portion of North America. The magnetic activity index,  $A_{Fr}$ , from Fredericksburg, Va., is also given for each day.

Note: Beginning with data for September 1955, Qa has been determined from reports that are available within a few hours or at most within a few days, including for the first time, the CRPL observations. Therefore these are the indices by which the forecasters assess every day the conditions in the recent past. Over a period of several years, they have closely paralleled the former Qa indices which excluded CRPL observations and included three additional reports received after a considerable lag. Qa was first published to the nearest one-third of a unit at the same time.

North Pacific Radio Path -- The CRPL quality figures, Qp, are compiled by the North Pacific Radio Warning Service (NPRWS), the CRPL forecasting center at Anchorage, Alaska, from radio traffic data for moderately long transmission paths in the North Pacific equivalent to Seattle-to-Anchorage or Anchorage-to-Tokyo. These include reports to CRPL by the Alaska Communications System, Aeronautical Radio, Inc., U. S. Air Force and Civil Aeronautical Administration. In addition, there are CRPL monitoring, direction finder observations and field strength measurements of suitable transmissions.

The original reports are on various scales and for various time intervals. The observations for each 8 hours or 24 hour period are averaged on the original scale. This average is compared with reports for the same period in the preceding two months and expressed

as a deviation from the 3-month mean. The deviations are put on the 1 to 9 scale of quality which is assumed to have a standard deviation of 1.25 and a mean for the various periods as follows:

03-10 hours UT	5.33
11-18	5.33
19-02	6.00
00-24	5.67

The 8-hour and 24-hour indices  $Q_p$  are determined separately. Each index is a weighted mean where the CRPL observations have unit weight and the others are weighted by the correlation coefficient with the CRPL observations.

The table, analogous to that for  $Q_a$ , includes the 8-hourly quality figures; whole day quality figures; short-term forecasts issued by NPRWS three times daily at  $02^h$ ,  $10^h$ , and  $18^h$  UT, applicable to the stated 8-hour periods; advance forecasts issued twice weekly by NPRWS (CRPL-Jp report); and half-day averages of geomagnetic K indices from Sitka.

The chart compares the outcome of advance forecasts, on the same basis as the similar chart for the North Atlantic Radio Path.

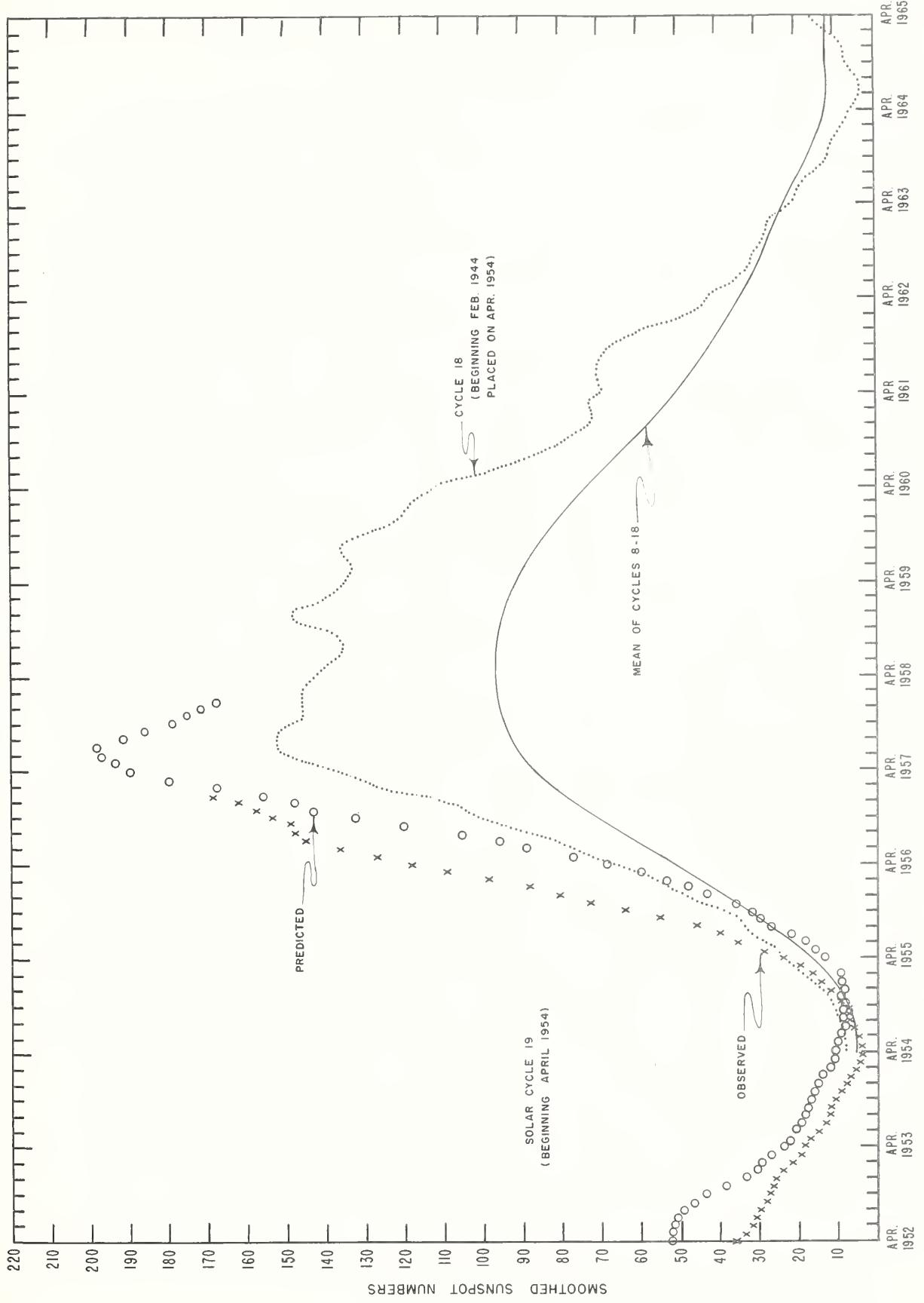
Note: Beginning with November 1956 the short-term forecast formerly made at 0900 UT was changed to 1000 UT. The North Pacific quality figures used for evaluation are now 8-hourly rather than 9-hourly.



## DAILY SOLAR INDICES

June 1957 Date	American Relative Sunspot Numbers RA'
1	144
2	168
3	173
4	168
5	175
6	167
7	134
8	146
9	153
10	140
11	144
12	165
13	175
14	155
15	200
16	198
17	221
18	265
19	229
20	233
21	221
22	222
23	212
24	208
25	192
26	169
27	158
28	150
29	172
30	192
Mean:	181.6

July 1957 Date	Zürich Provisional Relative Sunspot Numbers RZ	Daily Values Solar Flux at 2800 Mc, Ottawa, Canada Flux
1	187	256
2	204	242
3	208	254
4	269	249
5	216	238
6	257	224
7	194	211
8	147	201
9	167	198
10	135	188
11	110	170
12	96	176
13	96	188
14	140	187
15	169	188
16	200	203
17	210	217
18	218	227
19	225	220
20	244	230
21	250	244
22	290	236
23	285	250
24	272	255
25	232	246
26	206	231
27	173	232
28	158	212
29	142	201
30	171	193
31	152	191
Mean:	194.3	218.0



## CALCIUM PLAGUE AND SUNSPOT REGIONS

JULY 1957

CMP July 1957	Lat.	McMath Plage Number	Return of Region	Calcium Plage Data				Sunspot Data		
				CMP Area	Values Int.	History, Age		CMP Area	Values Count	History
01.1	N40	4049	*	(300)	(2)	b-d	1			
01.5	N13	4042	**	(600)	(1)	b-d	1			
02.0	S18	4041	3997	4,500	3	l-l	10	90	6	l^l
02.7	S12	4043	*	5,000	3.5	l-l	1	810	3	l-l
03.2	N08	4055	***	(1,500)	(1.5)	b\l	4			
04.0	S14	4045	3998	3,000	2.5	l\l	4	210	1	l-l
05.0	N17	4046	3999	5,000	3	l-l	4	760	9	l-l
05.1	S27	4044	4003	8,000	3.5	l-l	2	1620	21	l\l
06.1	S17	4060	++	(4,000)	(1.5)	b-l	2			
06.4	S21	4047	4002	2,200	1.5	l\l	3			
06.8	N28	4056	+	(300)	(1.5)	b-d	1			
07.7	N13	4048	*	3,000	3.5	l\l	1	120	5	l\l
07.7	N25	4057	*	200	2	b-l	1	10	1	b\l
07.9	S34	4054	*	800	1	b\l	1			
10.0	N15	4050	4010	600	1.5	l\l	4			
10.0	S13	4051	4009	3,000	3.5	l\l	4	350	6	l\l
12.0	S15	4052	4012	2,000	2.5	l\l	5			
12.6	N31	4053	4011	4,000	3	l\l	2	100	1	l\l
13.6	N19	4068	*	300	3	b\l	1	30	3	b-d
14.1	S16	4058	4012	1,800	2.5	l\l	5	(10)	(2)	l\l
14.5	N08	4059	*	800	2.5	l\l	1	10	1	l\l
14.5	S31	4061	*	1,600	3.5	b\l	1	820	8	b\l
16.0	N22	4069	+	300	1	b-d	1			
16.1	S13	4062	4018	400	1	l-d	3			
17.4	S18	4063	4018	1,600	2.5	l\l	3	210	3	l-l
18.5	S13	4074	+	300	2.5	b-d	1	20	1	b-d
19.1	N33	4064	*	700	2.5	l\l	1			
19.2	S10	4077	+	400	1.5	b-l	1	190	1	l\l
19.6	S19	4072	*	1,000	3.5	b\l	1	340	7	b\l
19.9	S10	4066	*	1,500	3.5	l-l	1	340	9	b-l
20.3	S35	4067	4021	5,400	2.5	l\l	3	140	3	l\l
20.4	N22	4065	++	15,000	3.5	l\l	2	1210	18	l\l
22.0	S22	4070	4030	5,500	3	l-l	3	680	16	l-l
22.0	S32	4071	*	2,300	2.5	l-l	1	80	3	l\l
22.3	N16	4076	*	500	2.5	b-l	1	80	2	b-d
23.8	N30	4073	4029	1,900	3.5	l\l	3	400	10	l\l
26.3	N15	4075	4039	9,000	3.5	l-l	3	870	55	l-l
27.2	N09	4078	4039	2,000	3	l\l	3			
27.5	S19	4079	4038	1,800	2	l\l	3			
29.9	S12	4080	4043	1,700	2	l-l	2	360	1	l-l
31.4	N12	4081	4046	2,500	1.5	l\l	5			
31.9	N32	4086	*	1,000	3.5	b-l	1	210	9	b\l

\* New.

+ New and ephemeral.

\*\* Merged with 4039.

++ Part of 3044.

\*\*\* Part of 3046.

+++ 3023, 3024, 3027.

CORONAL LINE EMISSION INDICES

JULY 1957

CNP July 1957	North East Quadrant (observed 7 days earlier)						South East Quadrant (observed 7 days earlier)						South West Quadrant (observed 7 days later)						North West Quadrant (observed 7 days later)							
	G <sub>6</sub>	G <sub>1</sub>	R <sub>6</sub>		R <sub>1</sub>		G <sub>6</sub>	G <sub>1</sub>	R <sub>6</sub>		R <sub>1</sub>		G <sub>6</sub>	G <sub>1</sub>	R <sub>6</sub>		R <sub>1</sub>		G <sub>6</sub>	G <sub>1</sub>	R <sub>6</sub>		R <sub>1</sub>			
			R <sub>6</sub>	R <sub>1</sub>	R <sub>6</sub>	R <sub>1</sub>			R <sub>6</sub>	R <sub>1</sub>	R <sub>6</sub>	R <sub>1</sub>			R <sub>6</sub>	R <sub>1</sub>	R <sub>6</sub>	R <sub>1</sub>			R <sub>6</sub>	R <sub>1</sub>	R <sub>6</sub>	R <sub>1</sub>		
1	73	121	25	43	164	269	37	66	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
2	73	94	14	20	168	260	29	51	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
5	137	188	18a	27a	148	162	33a	62a	171	206	200	150	16	35	143	209	x	x	x	x	x	x	x	x	x	x
6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
7	75	108	x	x	x	x	x	x	133	197	x	x	145a	285a	207	350	29	45	140	187	x	x	x	x	x	x
8	88a	140a	20a	26a	33	124a	150a	18a	150a	182	32	65	x	x	141	173	x	x	90	170	x	x	x	x	x	x
9	107	162	27	33	138	138	180	x	x	x	x	x	x	x	137a	168a	x	x	x	x	x	x	x	x	x	
10	127	200	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
11	131	152	48	98	130	215	32	76	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
12	124	200	21	35	120	250	19	54	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
13	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
14	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
15	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
16	77	103	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
17	x	x	x	x	x	x	x	x	135	151	29	49	x	x	x	x	x	x	x	x	x	x	x	x	x	
18	90	115	22	41	176	236	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
19	153	207	x	x	40	49	134	274	58	84	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
20	152*	259	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
21	137a	24.5a	x	x	x	x	x	x	250a	293a	x	x	131a	147a	220	300	33	60	163	300	x	x	x	x	x	
22	130	230	x	x	x	x	x	x	197	240	x	x	100	120	120a	40a	24	57a	121a	121a	x	x	x	x	x	
23	x	106a	x	x	x	x	x	x	120a	160a	x	x	x	x	75a	105a	x	17	30	143	112	184	184	184	184	
24	77a	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	16	45	128a	128a	128a	128a	128a	128a	
25	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
26	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
27	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	61	85	22	43	84	101	x	x	
28	76	115	20	35	104	150	29	60	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
29	87	14.0	14	17	92	117	40	66	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
30	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
31	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	98	130	25	46	185	200	23	43	

\*\* = yellow line unobserved.  
 a = index computed from low weight data.  
 x = no observations.

## SOLAR FLARES

JULY 1957

Observatory	Date July 1957	Time Observed		Duration	Importance	McMath Plage Region Number	Approx. Position Lat. Mer. Dist.	Time Max. Phase UT	Total Rel. Area Area of Mill. Max. Int. Arb.	Provis. Iono- spheric Effect
		Start UT	End UT							
TASHKENT	01	0144 E	0220	160	16	4047	S12 E57	0148		S-SWF
KODAIKANAL	01	0246	0414	20	16	4030	N14 W14	0352	156	G-SWF
TASHKENT	01	0436	0549	73	16	4030	N12 W16	0456		
SIMEIZ	01	0620	0633	13	16	4050	N26 W90	0623	175	
CHIPEJOV	01	1000 E	1036	240	16	4050	S25 W78	1007		
{ CAPRI S	01	1002 E	1028 D	260	16	4030	S20 W30		219	S-SWF
OTTAWA	01	1217	1218	1	1	4048	N13 E48	1210	118	
{ CAPRI S	01	1218	1216	1	1	4046	N13 E51		194	
CHIPEJOV	01	1220 E	1221 D	10	16	4046	N14 E49			
{ CHIPEIZ	01	1228	1230 D	160	1	4039	N09 W14		194	
CHIPEJOV	01	1232 E	1234	20	1	4039	N08 W14			
*{ SAC PEAK	01	1402	1442	40	1	4039	N10 W19	1410	142 2 13	
*{ CHIPEJOV	01	1415 E	1429	200	1	4039	N09 W20			
OTTAWA	01	1500	1707	17	1	4030	N13 W21	1646	111	
HAWAII	01	1950 E	2022	540	2	4037	N11 W24	2008	350	
{ HAWAII	01	2010 E	2105 D	260	16	4030	N12 W20			Slow S-SWF
HAWAII	01	2012	2042	70	1	4044	S31 E35	2236	180	
* SAC PEAK	01	2237 E	2247 D	100	1	4044	S32 E42	2307	117 9 16	
CHIPEIZ	02	0544			16	4039	N15 W34		181	
CHIPEJOV	02	0557 E	0607	100	1	4030	N11 W28			
{ CAPRI S	02	0710	0722	42	1	4046	S27 E31		194	
{ CHIPEIZ	02	0715 E	0744	220	16	4044	S30 E30			
CHIPEJOV	02	0724 E	0728	140	1	4044	S28 E32			
CHIPEJOV	02	0750	0756	6	1	4039	N09 W29			
{ CHIPEIZ	02	0755 E	0847 D	320	2	4039	N09 W31			
{ CAPRI S	02	0823 E	0842 D	190	1	4039	N09 W28		170	
CHIPEIZ	02	0821 F	0848 D	170	2	4030	S23 W90			S-SWF
CAPRI S	02	1014	1023 D	90	1	4046	N13 E37		160	
CAPRI S	02	1014 E	1053	290	1	4039	N07 W35		117	
UCOLE	02	1051 F	1041 D	100	2	4041	S12 W11			
HAWAII	02	2100	2110	10	1	4043	S12 W14	2104	112	
{ HAWAII	02	2100 E	2115 D	150	1	4043	S12 W05			
* HAWAII	02	2130	2156	26	1	4039	N11 W32	2134	156	
HAWAII	03	0608	0028	20	1	4039	N10 W40	0014	185	
HAWAII	03	0700	0027	7	1	4043	S12 W14	0024	131	
HAWAII	03	0712	0132	10	1	4041	S11 W17	0126	112	
{ HEDDON	03	0714	1030 D	1960	3	4039	N14 W45			
SCAUNISLAND	03	0720 E			28	4039	N15 W37			S-SWF
CHIPEJOV	03	0720	0820	60	26	4039	N14 W40	0741		
{ CAPRI S	03	0722	1109	227	36	4039	N13 W40		1312	
CHIPEIZ	03	0725	0830	45	26	4039	N14 W39	0735		
{ UCOLE	03	0806 E			3	4039	N10 W37	0900		
{ TASHKENT	03	0815 E	0820 D	750	3	4039	N10 W40	0847		
CHIPEIZ	03	0827 E	1107 D	1600	26	4039	N11 W39			S-SWF
CHIPEIZ	03	0832 E	1112	1600	26	4039	N11 W44	0840		
RO HERST	03	0911 F	1148	1070	16	4039	N09 W42			
CHIPEJOV	03	1300 E	1208	80	1	4048	N16 E61	0958	160	
{ SAC PEAK	03	1625	1650	25	1	4043	S10 W21	1630	130 9 25	
{ CHIPEJOV	03	1629 E	1642	130	1	4043	S10 W22			G-SWF
CHIPEJOV	03	1719 E	1740	120	1	4047	S29 E16	1729		
* HAWAII	03	1820	1922	12	1	4046	N14 E27	1922	156	
{ SAC PEAK	03	2013	2300	47	1	4046	N14 E24	2233	150 4 28	
{ HAWAII	03	2214	2244	30	1	4046	N12 E22	2218	146	
HAWAII	03	2230	2244	14	2	4046	N13 E25	2234	206	
HAWAII	04	1030	0040	10	2	4046	N14 E25	0032	269	
CHIPEJOV	04	1437 E	0444	70	1	4046	N15 E19			
CHIPEJOV	04	0542 E	0553	110	1	4046	N15 E21			
SIMEIZ	04	0617	2630	13	1	4045	S20 E02	0619	260	
SIMEIZ	04	2650	0658	5	1	4043	S17 W28	0452	170	
{ CAPRI S	04	0713	0710	11	16	4051	S17 E60	0705	300	
CHIPEJOV	04	0715 E	0747	220	16	4046	N08 W00	0720	146	
SIMEIZ	04	0749	0900	12	1	4045	S15 E00	0753	300	
SIMEIZ	04	0850	0920	40	2	4043	S18 W28	0901	960	
CHIPEJOV	04	0956 E	0950	30	1	4043	S11 W32			

Capri S. = Anacapri (Swedish).

Kodaikanal = Kodaikanal.

Krasnya = Krasnaya Pakhra.

RO Edin = Royal Observatory, Edinburgh.

RO Herst = Greenwich Royal Observatory, Herstmonceux.

Sac Peak = Sacramento Peak.

Schauins = Schauinsland.

USNRL = United States Naval Research Laboratory.

E = less than.

D = greater than.

U = uncertain.

F = Approximate.

&amp; plus.

Slow S-SWF

## SOLAR FLARES

JULY 1957

Observatory	Date July 1957	Time Observed		Duration	Importance	McMath Plage Region Number	Approx. Position	Time Max. Phase	Total Area of Mill. Max.	Rel. Area Max. Int. Arb.	Provis. Iono- spheric Effect
		Start UT	End UT								
{ MOSCOW MOSCOW MC MATH OTTAWA CAPRI S ONDREJOV ONDREJOV SAC PEAK CAPRI S MC MATH	04	1142 E	1156 D	14D	2	4048	N11 E30				
	04	1154 E			2	4047	S10 E43				
	04	1200 E	1225 D	25D	1	4044	S26 F0				
	04	1202	1230	28	1	4044	S27 E06	1204	96		S-SWF
	04	1203	1221	18	1	4044	S29 E08		112		
	04	1207 E	1216	9D	1	4044	S29 E07				
	04	1245 E	1430	14D	1&	4046	N09 E05				
	04	1425	1445	20	1	4046	N09 W05	1428	131	2	S-SWF
	04	1427 E	1447	20D	1	4046	N08 W08		102		
	04	1430 E	1507 D	37D	1	4046	N08 W04				
{ SIMEIZ SIMEIZ OTTAWA CAPRI S ONDREJOV TORTOSA MC MATH MC MATH SAC PEAK	05	0624	0641	17	1	4045	S10 W14	0627	175		
	05	0652	0656	4	1	4041	S18 W42	0653	87		
	05	1231	1253	22	1&	4043	S09 W44	1238	140		
	05	1236	1256	10	1	4043	S11 W46		253		
	05	1239 E	1252	13D	1	4043	S12 W47	1241			
	05	1242 E	1253 D	11D	2	4042	S10 W45				
	05	1242 E	1253 D	11D	2	4043	S10 W45				
	05	1720 E	1905 D	45D	1	4043	S10 W45				
	05	2317	2400 D	43D	2	4046	N16 W15	2357	360	1	G-SWF
	06	0610	0615	5	1	4043	S15 W27	0610	175		
{ ONDREJOV CAPRI S SIMEIZ * ONDREJOV OTTAWA	06	0618 E	0629	11D	1	4043	S10 W58				
	06	0620 E	0642	22D	1	4043	S10 W50		131		
	06	0742	0750	8	1&	4043	S15 W28	0743	305		
	06	1053 E	1102	9D	1	4143	N12 E17	1056	98		
	06	1259	1339	40	1	4046	N12 W32				
	07	1013 E	1027	14D	1	4043	S12 W70				
	07	1158	1234	36	1&	4046	N09 W46	1205			
	07	1202 E	1236	34D	1&	4046	N11 W45				
	07	1302	1405	63	1	4044	S28 W36	1325	135	3	Slow S-SWF
	07	1303 E	1348	45D	2	4044	S28 W33	1314			
{ ONDREJOV SCHAUNIS * ONDREJOV ONDREJOV HAWAII HAWAII HAWAII	07	1306 E	1355 D	49D	1	4044	S25 W30				
	07	1329 E	1400	31D	1&	4046	N29 W33				
	07	1413 E	1417	4D	1	4046	N10 W46				
	07	1710 E	1719 D	9D	1	4046	N09 W48				
	07	2104	2018	14	1	4046	N13 W36	2008	170		S-SWF
	07	2050	2058	8	1	4046	N10 W50	2052	199		
	07	2050	2300	13D	2	4046	N14 W03	2154	296		
	08	0521			2&	4046	N13 W41	0539 F			S-SWF
	08	0529	0552	23	1&	4046	N13 W40				
{ ONDREJOV CAPRI S ONDPEJOV ONDPEJOV CAPPI S HAWAII MC MATH	08	0537 E	0620	43D	2	4046	N14 W40				G-SWF
	08	0608	0634	26	1	4046	N12 W48		165		
	08	0624	0635	11	1	4046	N14 W45	0628			
	08	0925 E	0936 D	11D	1&	4046	N09 W55				
	08	0929	1008	39	1&	4046	N12 W61		248		S-SWF
	08	1854	1910	16	1	4044	S30 W42	1856	330		
	08	1950 E	2015 D	25D	2	4044	S25 W42				Slow S-SWF
	09	0744	0766	22	1	4048	N14 W17	0046	175		
	09	0640	0656	16	1	4051	S17 W17	0448	175		
	09	0750	0803	13	1	4043	N07 W32	0752	120		
{ SIMEIZ CAPRI S HAWAII SAC PEAK	09	0919	0830	11	1	4051	S15 W14	0820	300		
	09	1013 E	1044	31D	1	4044	S30 W50		165		
	09	2252 E	2300	8D	1	4048	N14 W28	2254	219		Slow S-SWF
	09	2253	2300	7	1	4048	N13 W28	2255	146	6	
	10	1243 E	1313	30D	1	4052	S11 E14		126		
{ CAPPI S USNPL SAC PEAK R O HEPST R O EDIN CAPPI S MC MATH	10	1412	1515	63	2	4044	S27 W80	1424			G-SWF
	10	1415	1437 D	22D	2	4044	S29 W80	1425	285	5	
	10	1418	1445	27	1&	4044	S29 W78	1428	151		
	10	1421	1435	14	1	4044	S30 W71	1427	802		
	10	1425 E	1455 D	30D	1	4044	S26 W75		219		
	10	1425 E	1455 D	30D	1	4044	S28 W64				
* OTTAWA	12	1511			1	4051	S10 W36		153		

## SOLAR FLARES

JULY 1957

Observatory	Date July 1957	Time Observed		Dura- tion Min.	Import- ance	McMath Plage Region Number	Approx. Position Lat. Mer. Dist.	Time Max. Phase UT	Total Rel. Max.		Provis. Iono- spheric Effect
		Start UT	End UT						Mill.	Area of Max.	
SIMEIZ	13	0720	0810	50	1	4066	S13 E90	0723	120		
SIMEIZ	13	0729	0739	10	1	4063	S21 E44	0731	300		
SIMEIZ	13	0810	0840	30	2	4063	S23 E38	0813	700		
SIMEIZ	13	0812	0840	28	1	4063	S27 E37	0816	175		
ONDREJOV	13	1212 E	1221	9D	1	4061	S34 E15				
OTTAWA	13	1339	1347	8	1	4065	N20 E74	1342	192		
CAPRI S	14	0710 E	0731 D	21D	1	4065	N25 E86			117	
ATHENS	14	0712	0723	11	2	4048	N24 W85				
{ ATHENS	14	0742	0803	21	2	4067	S36 E59			S-SWF	
ARASTUMANI	14	0743 E				4067	S34 E47				
CAPRI S	14	1203	1225	22	1	4065	N25 E85			117	
MCMATH	14	1223 E	1235 D	12D	1&	4065	N21 E63				
{ CAPRI S	14	1338	1347	9	1	4065	N25 E83			S-SWF	
MCMATH	14	1340 E	1403 D	23D	1&	4065	N21 E63			107	
{ ONDREJOV	14	1442 E	1453 D	11D	1	4065	N24 E83			107	
CAPRI S	14	1442	1454	12	1	4065	N25 E83				
MCMATH	14	1447 E	1502 D	15D	1&	4065	N21 E63				
ATHENS	15	0617	0625	8	2	4065	N28 E79				
SIMEIZ	15	0737	0754	17	2	4067	S18 E61	0741	786		
SIMEIZ	16	0715	0740	25	1&	4067	S38 E65	0719	611		
{ CAPRI S	16	0732	0809	37	1&	4065	N30 E76		233	S-SWF	
ARASTUMANI	16	0734	0803	29	2	4065	N33 E84				
{ R O HEPST	16	0744 E	0810	26D	1&	4073	N31 E82	0744	175		
USNRL	16	1740				4061	S29 W30				
SAC PEAK	16	1742	1947 F	125F	1&	4061	S33 W30	1800	180	7	30
HAWAII	16	1742	1952	130	1	4061	S38 W21	1818	199		
MCMATH	16	1743 E	1957 D	134D	1&	4061	S32 W30				
* HAWAII	16	1818	1830	12	1	4067	S38 E25	1820	199		
HAWAII	17	0112	0148	36	2	4065	N11 E30	0116	296		
ONDREJOV	17	0546 E	0555	9D	1	4067	S38 E21				
UCCLE	17	0553	0612	19	2	4065	N25 E57				
SIMEIZ	17	0623	0645	22	1&	4067	S39 E40	0632	200		
{ ONDREJOV	17	0625 E	0640	15D	1	4065	N29 E57				
UCCLE	17	0630	0644	14	2	4065	N31 E63				
SIMEIZ	17	0656	0713	17	1&	4063	S16 E10	0703	611		
UCCLE	17	0704	0712	8	2	4070	S14 E50				
CAPRI S	17	0833	0844	11	1	4067	S35 E19			160	
{ CAPRI S	17	1217	1238	21	1	4067	S34 E14		219	G-SWF	
OTTAWA	17	1218	1235	17	2	4067	S36 E20	1220	176		
{ MCMATH	17	1303 E	1347 D	44D	1	4070	S21 E56				
HAWAII	17	1835 E	1850 D	15D	1	4065	N20 E30				
{ HAWAII	17	1838	1946 D	8D	1	4065	N11 E20	1838	117	Slow S-SWF	
ONDREJOV	18	0535 E	0544	9D	1&	4067	S38 E12	0538			
{ CAPPI S	18	0732	0742	10	1	4067	S38 E08		126		
ONDREJOV	18	0733 E	0737 D	4D	1&	4067	S38 E10				
SIMEIZ	18	0816	0825	9	1	4067	N09 W75	0819	134		
{ CAPPI S	18	1108	1121	13	1	4067	S38 E05		126		
ONDREJOV	18	1250 E	1313	23D	1&	4065	N24 E25				
MCMATH	18	1257 E	1315 D	18D	1	4065	N22 E23				
HAWAII	18	2234	0030	116	2	4070	S22 E26	2306	486		
SAC PEAK	18	2328 E	2412 D	44D	2	4070	S23 E30	2328 E	400	4	20
SIMEIZ	19	0610	0650	40	1	4067	S40 E30	0624	262		
SIMEIZ	19	0613	0710	57	1&	4067	S38 E22	0630	349		
SIMEIZ	19	0620	0710	50	1	4067	S43 E24	0630	175		
CAPPI S	19	0827 E	0832 D	5D	1	4061	S27 W66		190		
ARASTUMANI	20	0642	0701	19	2	4065	N27 E00				
ARASTUMANI	20	0708	0747	39	2	4075	N12 E85				
SIMEIZ	20	0828	0834	6	1	4067	S36 W01	0831	100		
SIMEIZ	20	0830	0945	15	1	4065	N23 E21	0831	600		

## SOLAR FLARES

JULY 1957

Observatory	Date July 1957	Time Observed		Dura- tion Min.	Import- ance	McMath Plage Region Number	Approx. Position Lat. Mer. Dist.	Time Max. Phase UT	Total Rel. Area of Mill. Max.	Max. Area Int. Arb.	Provis. Iono- spheric Effect
		Start UT	End UT								
{ R O HERST	20	1405	1500	55	1	4073	N30 E21	1410	87		
CAPRI S	20	1406	1503	57	1	4065	N30 E21		117		
MCMATH	20	1409 E	1514 D	5D	1&	4065	N22 W02				
KANZELHOHE	20	1418 E	1428 D	10D	2&	4076	N28 E22				
HAWAII	20	2212	2234	22	1	4073	N29 E21	2216	136		
HAWAII	21	0002	0100	58	2	4073	N28 E17	0022	258		
ONDREJOV	21	0633	0737	64	2	4065	N30 E14	0659			
{ CAPRI S	21	0637 E	0725 D	48D	2	4065	N30 E10		360		
UTRECHT	21	0712 E	0721	9D	2&	4073	N28 E26				
ONDREJOV	21	0726 E	0737	11D	1	4075	N13 E70	0751			
ONDREJOV	21	0748	0758	10	1&	4075	N13 E70				
{ CAPRI S	21	1203	1313	70	2	4073	N30 E25		350		
ONDREJOV	21	1205	1233 D	28D	1	4073	N31 E24				
KHARKOV	21	1227 E	1249	22D	2	4073	N29 E27				
{ CAPRI S	21	1240 E	1327 D	47D	1	4075	N13 E61		107		
KHARKOV	21	1249 E			2	4075	N08 E66				
ONDREJOV	21	1250 E	1302 D	12D	1	4075	N13 E68				
SAC PEAK	21	1320	1440	80	2	4065	N30 E10	1338	382	4	30
{ CAPRI S	21	1321	1424	63	2	4065	N30 E07		282		
ONDREJOV	21	1322	1401 D	39D	2	4073	N30 E10	1339			
KHARKOV	21	1324 E	1438	74D	3	4073	N28 E16				
* MCMATH	21	1330 E	1410 D	40D	2	4065	N22 W13				
* CAPRI S	21	1407	1459 D	52D	1	4075	N13 E60				
SAC PEAK	21	1740	1752	12	1	4065	N21 W12	1745	233		
{ HAWAII	21	1816	1838	22	1	4073	N29 E10	1822	180	6	22
SAC PEAK	21	1817	1850 F	32F	1	4065	N30 E11	1825	110	6	18
* HAWAII	21	1920	1954	34	1	4075	N10 E63	1932	224		
* HAWAII	21	1924	2018	54	2	4070	S25 E14	1940	364		
HAWAII	21	1948	2050	62	2	4073	N30 E08	2006	296		
SAC PEAK	21	2002 E	2010 D	9D	1	4065	N30 E10	2005	167	5	18
HAWAII	21	2032	2050	18	1	4075	N10 E63	2034	306		
{ HAWAII	21	2134	2258	84	1&	4073	N30 E08	2144	194		
SAC PEAK	21	2135	2255 F	80F	1&	4065	N31 E08	2143	222	3	18
{ KRASNYA	22	0614	0640	26	2	4065	N30 E03	0627			
ONDREJOV	22	0616 E	0700	44D	2	4065	N28 E03	0622			
ONDREJOV	22	0619	0624	5	1	4065	N30 W07				
ONDREJOV	22	0623 E	0628	5D	1&	4075	N10 E52				
UCCLE	22	0624	0658	34	2	4065	N30 W02				
UCCLE	22	0626	0636	10	2	4073	N30 E25				
SIMEIZ	22	0630	0650	20	1		S23 E44		221		
SIMEIZ	22	0630	0700	30	1	4071	S39 W15		221		
ONDREJOV	22	0720 E	0752 D	32D	1&	4066	S10 M34				
ONDREJOV	22	0745 E	0800 D	15D	1&	4073	N32 E26				
CAPRI S	22	1202 E	1225	23D	1	4070	S22 E01		112		
R O EDIN	22	1300 E	1505	125D	1&	4070	S21 E09	1316	549		
CAPRI S	22	1305 E	1425	80D	2	4070	S25 E06		437		
R O HERST	22	1309 E	1317 D	8D	1	4070	S22 E08	1315 U	156		
MEUDON	22	1310 E	1415	65D	2	4070	S22 E08				
CAPRI S	22	1332 E	1339	7D	1	4065	N20 W23		102		
SAC PEAK	22	1431 F	1500	29D	2U	4070	S23 E05	1431 E	270	7	12
* R O EDIN	22	1527	1539 D	12D	1	4070	S22 W01		165		
SAC PEAK	22	1648	1750 E	62E	1	4073	N30 W07	1655	125	5	16
HAWAII	22	1824	1832	8	1	4070	S23 W02	1826	160		
HAWAII	22	2224	2236	12	1	4070	S23 W04	2228	160		
HAWAII	22	2236	2240	4	1	4065	N21 W27	2238	156		
HAWAII	22	2306	2322 D	16D	1	4070	S23 W04	2308	185		
HAWAII	22	2310	2322	12	1	4073	N30 W05	2316	190		
HAWAII	22	2338	0010	32	2&	4073	N31 W05	2344	608		
SIMEIZ	23	0040	0048	8	1	4065	N12 W20				
SIMEIZ	23	0820	0850	30	1&	4065	N16 W19	0822	160		
CAPPI S	23	0850 E	0942	52D	1	4071	S26 W04		524		
CAPRI S	23	0911 E	0927	16D	1	4075	N15 E41		117		
USNRL	23	1259			2	4070	S25 E06		141		
CAPRI S	23	1340	1421	41	1	4075	N15 E39				
MT WILSON	23	1712	1842 D	90D	2	4070	S25 W25				
USNRL	23	1805			2&	4070	S35 W22		126		

## SOLAR FLARES

JULY 1957

Observatory	Date July 1957	Time Observed		Dura- tion Min.	Import- ance	McMath Flage Region Number	Approx. Position Lat. Mer. Dist.	Time Max. Phase UT	Total Rel. Area Area of Mill. Max. Arb.	Prov. Iono- spheric Effect
		Start UT	End UT							
HAWAII	24	0036 E	0106	300	1	4070	S23 W10	0040	170	
SIFITZ	24	0529	0700	31	16	4065	N71 W16	0633	349	
CAPRI S	24	0632 E	0710 D	380	1	4070	S23 W21		141	
SIFIZ	24	0720	0723	13	1	4065	N23 W15	0721	175	
SIMEIZ	24	0724	0805	41	1	4065	N28 W33	0742	436	
SIMEIZ	24	0845	0910	25	2	4065	N23 W14	0849	611	
{ OTTAWA	24	1239	1315	36	16	4065	N12 W50	1242	188	
{ CAPRI S	24	1240	1310	30	1	4065	N23 W52		199	
{ OTTAWA	24	1438		2	1	4070	S31 W22	1447	203	
{ CAPRI S	24	1440	1516	36	1	4070	S22 W20		122	S-SWF
MCMATH	24	1445 E	1510 D	25D	1	4070	S25 W25			
MCMATH	24	1740 E	1930 D	110D	1	4070	S25 W30			
HAWAII	24	1916 E	2014	118D	3	4070	S24 W22	1828	1120	S-SWF
HAWAII	24	2324	2344	20	1	4065	N18 W60	2328	306	G-SWF
CAPPI S	25	0700 F	0738 D	38D	2	4065	N31 W36		350	S-SWF
CAPPI S	25	0802 E	0920 D	78D	1	4073	N31 W16		122	Slow S-SWF
OTTAWA	25	1103	1152	49	16	4075	N15 E09	1106	140	
CAPPI S	25	1225 E	1313 D	48D	1	4073	S32 W21		112	
* OTTAWA	25	1246	1302	16	1	4075	N10 E00	1250	95	Slow S-SWF
* OTTAWA	25	1255	1320	25	16	4073	M32 W22	1259	109	
* OTTAWA	25	1401	1426	25	1	4073	N31 W20	1403	101	
{ OTTAWA	26	1417	1424	7	1	4082	S28 E72	1419	202	
{ CAPPI S	26	1417 E	1430	130	1	4082	S30 E83		165	
HAWAII	26	2132	2152	20	1	4075	N11 W05	2146	204	
HAWAII	26	2226	2234	8	1	4075	N20 W05	2226	160	
CAPPI S	27	0602	0629	27	1	4073	N32 W42		107	
CAPRI S	27	0631	0741	70	1	4075	N10 W18		170	
{ CAPPI S	27	0653	0808	75	2	4070	S21 W61		267	S-SWF
{ CRIMEA	27	0655	0810	75	2	4070	S37 W63			
NAPLES	27	0706 F	0800	54D	26	4070	S13 W43			
UTRECHT	27	0706 E	0900	54D	26	4070	S13 W43			
ARCFTRI	27	0708	0804 D	56D	2	4070	S21 W60			
SIMEIZ	27	0819	0828	9	1	4067	S32 W86	0820	131	
* SAC PEAK	27	1332	1342	10	1	4075	N21 W11	1338	155	2 16
CAPRI S	27	1512	1547 D	35D	1	4075	N22 W15		112	
CAPRI S	27	1539 E	1553 D	14D	1	4065	N29 W70		219	
{ SAC PEAK	27	2130	2135 D	5D	1	4075	N09 W22	2135 D	185	3 17
{ MCMATH	27	2138 E	2150 D	12D	16	4075	N15 W20			
MITAKA	28	0027 E	0052 D	25D	1	4075	N11 W22	0046	198	
MITAKA	28	0027 E	0056 D	29D	16	4075	N11 W25	0039	301	
SIMEIZ	28	0705	0820	75	2	4081	N10 E26	0712	873	
CAPRI S	28	1033	1105 D	32D	1	4082	S28 E60		141	S-SWF
* KHARKOV	28	1127 E	1146 D	19D	2	4070	S22 W72	1127		
{ OTTAWA	28	1346	1453	7	3	4070	S24 W75	1405	815	
USNRL	28	1347	1500	73	2	4070	S21 W80	1400		
{ SAC PEAK	28	1350	1432	42	16	4070	S26 W90	1405	215	6 18
* OTTAWA	28	1359 E	1413 D	14D	1	4070	S23 W90			G-SWF
OTTAWA	28	1413			1	4065	N33 W66		179	
	28	1508	1515	7	1	4083	N26 E80	1510	169	
ARASTUMANI	29	0508 E			2	4065	N28 W86			S-SWF
* ONDREJOV	29	1424 E	1431 D	7D	16	4081	N10 E16			
* MCMATH	29	1425 E			1	4081	N15 E20			
* HAWAII	29	2122	2128	6	1	4075	N11 W56	2124	238	
{ SAC PEAK	29	2325	2350	25	1	4075	N14 W38	2330	135	9 15
{ HAWAII	29	2328	2358	30	2	4075	N18 W38	2332	360	
SIMEIZ	30	0710	0735	25	1	4084	N15 E72	0725	131	
SIMEIZ	30	0820	0900	40	1	4081	S31 E58	0822	349	
* OTTAWA	30	1417			1	4083	N26 E61		134	
MCMATH	30	1758 E	1852 D	54D	1	4083	N24 E60			
{ MITAKA	30	2315 E	2327	12D	1	4083	N27 E60		179	
{ SAC PEAK	30	2317	2337 D	20D	1	4083	N25 E62	2320	148	4 20
* CAPRI S	31	1033	1054	21	1	4075	N15 W60		165	
OTTAWA	31	1305	1310	5	1	4075	N17 W74	1307	113	
ONDREJOV	31	1500 E	1507	7D	1	4082	S31 E27	1502		
ONDREJOV	31	1558 E	1606	8D	1	4082	S31 E27	1559		
ONDREJOV	31	1637 E	1645 D	8D	1	4082	S31 E27			
HAWAII	31	2224	2236	12	16	4088	S23 E28	2230	393	

\* Rated as importance 1- by other observatory(ies).

Subflares noted as follows (Date, time (UT), coordinates):

S. Peak:	unmarked	McMath:	++	Mitaka:	*
Capri-S:	+				
July 01,	1205E (N12,E40)++	July 09,	1410 (N10,W80)+	July 18,	1256E (N27,E24)
01,	1340 (S23,W85)	09,	1518 (N15,W60)	18,	1427 (N32,E50)
01,	1341E (S19,W85)+	09,	1520 (N12,W63)+	18,	1500 (S20,E14)
01,	1402 (S17,E28)	09,	1540 (N27,W56)	18,	1508 (S10,E17)
01,	1420E (N10,W16)+	09,	1542 (N09,W82)	18,	2025E (N20,E20)++
01,	2300 (N10,W26)	09,	1644E (N08,E70)++	18,	2045E (N22,E13)
02,	0725 (N09,W27)+	09,	1746 (S30,W56)	18,	2335 (N25,E33)
02,	1433 (N14,E74)	09,	1903 (N09,W80)	18,	2350 (S38,E00)
02,	1440 (N10,W34)	09,	2047 (N16,W28)	19,	1405E (N20,E10)++
02,	1513 (N10,W34)	09,	2135E (N13,W63)	20,	1806E (S32,W90)
02,	2132E (N12,W35)++	10,	0948 (S11,W02)+	20,	2034 (N10,E71)
02,	2352 (N10,W40)	10,	1323E (S12,E14)	20,	2130 (N10,E72)
02,	2400 (S12,W15)	10,	1559 (S11,W10)+	20,	2157 (N29,E21)
03,	1255 (N15,E32)+	10,	1559 (S11,E12)+	21,	1055 (N13,E62)+
03,	1255E (N14,E32)	10,	1605E (S16,E16)	21,	1312E (N12,E67)
03,	1255 (N13,E56)	10,	1605E (S11,W12)	21,	1312E (N27,E26)
03,	1355 (S29,E26)	11,	1511E (S32,E40)+	21,	1330 (N22,W14)
03,	1350 (S10,W21)	11,	1516E (S14,E45)	21,	1405 (N12,E65)
03,	1400 (S10,W21)	12,	1510 (S10,W38)	21,	1425 (S10,W27)
03,	1410 (N07,E08)	12,	1702 (S17,W47)	21,	1545 (N11,E63)
03,	1410 (S10,W21)	14,	0914E (N25,E85)+	21,	1650 (S23,E11)
03,	1417 (N11,E08)+	14,	1250 (N25,E83)+	21,	1655 (S09,W29)
03,	1825E (S28,E13)	14,	1630 (N25,E80)	21,	1710 (N31,E32)
03,	1918 (N14,E27)	14,	1655 (N27,E78)	21,	1757 (N12,E64)
03,	2125 (S09,W24)	15,	0706E (S31,W11)+	21,	1920 (N11,E62)
03,	2143 (N13,E26)	15,	1143 (S33,W14)+	21,	1920 (S24,E17)
04,	1345E (S12,W31)	15,	2308E (S35,W22)	21,	2215E (N20,W15)
04,	1738 (N14,W58)	16,	0838 (S32,E30)+	22,	0826 (S22,E02)+
04,	1823 (N09,W07)	16,	1323 (N26,W85)	22,	1029E (S14,W72)+
04,	1848 (N14,E40)	16,	1437 (N18,E43)	22,	1029E (S23,E07)+
04,	2040E (S13,W33)	16,	1453 (S35,W31)	22,	1230E (N30,W03)+
05,	1705 (S12,W47)	16,	1547 (N32,E76)	22,	1244 (S24,E08)+
05,	1745 (N28,E80)	16,	1550 (S18,E12)	22,	1431 (S14,W77)
05,	1945E (N33,E89)	16,	1817 (S36,E27)	22,	1515 (N13,W44)
06,	0116E (N14,W18)*	16,	2140 (S38,E26)	22,	1520 (S23,W03)
06,	0133E (N15,W05)*	16,	2155E (S37,E39)	22,	1535 (N20,W24)
06,	1050 (N11,E21)+	17,	1018 (N14,E13)+	22,	1540 (S13,W40)
06,	1125 (S10,W58)+	17,	1230E (S21,E56)++	22,	1545 (N31,E19)
06,	1228 (N09,W32)+	17,	1255 (N27,E36)	22,	1655 (N21,W24)
06,	1410 (S24,E90)	17,	1259E (N20,E40)++	22,	1707 (N14,W47)
06,	1827F (S11,W61)	17,	1313 (S26,W23)	23,	1105 (N33,W24)+
06,	2150 (S30,W31)	17,	1328E (N20,E40)++	23,	1512 (S25,W14)
07,	1410 (N11,W47)	17,	1331E (S21,E56)++	23,	1543 (N32,E06)
07,	1440E (N20,W35)++	17,	1635 (N28,E58)	23,	1553 (N20,W37)
07,	1927 (N12,W50)	17,	1915E (S21,E56)++	23,	1557 (N12,E90)
07,	2005 (N14,W36)	17,	2035 (N27,E34)	23,	1607 (N32,E07)
07,	2055F (N10,W49)	17,	2117 (S09,E27)	23,	1702 (S24,W15)
07,	2145F (N14,W01)	17,	2117 (S42,E42)	25,	0800E (N08,E06)+
09,	1410 (N12,W78)	18,	1248 (N29,E24)+	25,	1118 (N10,E05)+
				30,	1418 (N24,E67)
				30,	1426E (N24,E60)++
				30,	1453 (N16,W59)
				30,	1512 (N16,W59)
				30,	2245E (N14,W67)

## IONOSPHERIC EFFECTS OF SOLAR FLARES

(SHORT-WAVE RADIO FADEOUTS)

June 1957

June 1957	Start UT	End UT	Type	Wide-spread Index	Importance	Observation stations	Known Flare, UT CRPL-F 155B
1 0045	0103	S-SWF	3	1	AN, TO		
1 0245	0305	S-SWF	3	1	AN, TO		0243
1 0345	0408	Slow S-SWF	5	1+	AN, OK, NE, CW <sup>+</sup>		
1 1257	1330	S-SWF	5	2+	BE, HU, MC, PR, CR, NE, SW, TH, RCA*, CW <sup>xx</sup>		
1 1805	1905	G-SWF	5	2	HU, MC, PR, WS		
1 2335	0052	Slow S-SWF	5	3	MC, OK, TO		2329
2 1513	1617	Slow S-SWF	5	3-	AN, BE, HU, MC, PR, WS, CR, NE, SW, TO		1512
3 1045	1105	S-SWF	5	2+	BE, MC, PR, DA, MA, NE, SW, TH, RCA*, CW <sup>xx</sup>		b1047
3 1318	1332	G-SWF	3	1	MC, PR		1318
3 1336	1402	Slow S-SWF	4	1	BE, MC, PR		b1337
4 0030	0142	Slow S-SWF	5	3	AD, OK, TO		b0027
4 0330	0455	Slow S-SWF	4	2	OK, TO		b0348
4 0900	0930	S-SWF	5	3-	DA, NE, OK, SW, TO, TH, CW <sup>xx</sup>		
5 0913	0946	S-SWF	5	1	MC, NE, PH, PO		b0912
5 1120	1138	Slow S-SWF	5	2-	BE, PR, NE, PH		1122
5 1328	1354	S-SWF	5	3-	BE, HU, MC, PR, MA, NE, PH, PU, SW, TH, RCA*, CW <sup>xx</sup>		1327
6 1631	1655	Slow S-SWF	5	1+	BE, HU, MC, PR, WS, HH		b1634
6 1700	1725	S-SWF	5	1+	BE, HU, MC, PR, WS, HH		1701
7 0339	0435	S-SWF	5	1+	OK, TO		
7 0815	0836	S-SWF	4	2	HH, NE, PH, PU		0813
7 1336	1408	G-SWF	3	1-	MC, PR		1325
7 1443	1458	S-SWF	5	1	BE, MC, PR, WS, NE, PH, PU		1440
8 0130	0226	Slow S-SWF	5	1	AD, OK, TO		
8 1811	1832	G-SWF	5	1	BE, HU, MC, PR		
9 0546	0600	S-SWF	4	1+	AN, TO		
9 1642	1715	Slow S-SWF	5	1	AN, BE, HU, MC, PR, WS		
9 1927	1955	S-SWF	3	1	AN, PR		
13 0645	0706	S-SWF	5	1+	OK, HH, NE		
13 0720	0753	S-SWF	5	2	OK, HH, NE, TO		b0720
13 0810	0840	Slow S-SWF	5	1+	OK, HH, NE		b0810
14 0540	0600	S-SWF	3	1-	AN, OK		
14 2358	0015	S-SWF	5	1	AD, AN, OK, TO		
15 0342	0455	Slow S-SWF	5	2	AD, AN, OK, TO, CW <sup>+</sup>		
15 0620	0635	S-SWF	4	1	AN, OK		0620
15 0735	0805	S-SWF	5	2	AN, OK, HH, NE, TO		0737
15 0937	0949	Slow S-SWF	2	1	NE, PH		
15 1107	1158	Slow S-SWF	2	1	LI, NE		1109
15 1730	1750	Slow S-SWF	5	1	AN, BE, MC, PR		1733
15 1800	1835	S-SWF	5	1+	AN, BE, HU, MC, PR		
16 0442	0532	Slow S-SWF	4	1	AN, OK		0444
16 0717	0744	S-SWF	3	2	HH, PU		0717
16 0908	0915	S-SWF	4	1	AN, PU		b0909
16 1630	1644	Slow S-SWF	3	1	BE, MC, PU		1612
16 1703	1727	G-SWF	3	1-	MC, PR		b1700
16 2030	2045	S-SWF	5	1+	AN, BE, HU, MC, PR, WS		2030

## IONOSPHERIC EFFECTS OF SOLAR FLARES

(SHORT-WAVE RADIO FADEOUTS)

June 1957

June 1957	Start UT	End UT	Type	Wide-spread Index	Importance	Observation stations	Known Flare, UT CRPL-F 155B
17	0625	0735	G-SWF	4	1+	AN, OK	0623
17	1305	1322	Slow S-SWF	4	1-	AN, PR	
17	1951	2020	S-SWF	4	1-	AN, BE, MC	
18	1552	1615	Slow S-SWF	5	1	AN, BE, MC, PR, WS, PU	b1558
19	0615	0656	Slow S-SWF	5	2-	AN, HH, NE, OK, PU	0612
19	1608	1652	S-SWF	5	3	AN, BE, HU, MC, PR, WS, CR, HH, MA, NE, PU, SW, TO, RCA <sup>*</sup>	1608
19	1732	1750	S-SWF	4	1+	AN, BE, HU, MC, CR	
20	0842	0855	Slow S-SWF	4	2	AN, HH	0830
20	1830	1855	G-SWF	3	1	MC, PR	1827
21	1102	1132	S-SWF	3	1+	HH, NE, PU	
21	1725	1735	G-SWF	4	1-	AN, BE, MC, PR	1725
21	1743	1802	Slow S-SWF	5	1	AN, BE, HU, MC, PR	1740
21	2220	2300	G-SWF	5	1-	MC, OK, WS, TO	2210
22	0229	0343	S-SWF	5	2	AN, OK, TO, CW <sup>+</sup>	0236
22	2056	2114	Slow S-SWF	5	1	AN, BE, MC, PR, WS	2052
22	2155	2215	G-SWF	5	1	MC, OK, WS, TO	2147
23	1227	1250	Slow S-SWF	5	1+	BE, MC, PR, NE, PU	1224
23	1343	1430	S-SWF	5	1	BE, MC, PR, PU	1340
23	1614	1642	G-SWF	4	1	BE, MC, PR	
24	0849	0917	S-SWF	5	3-	OK, DA, HH, MA, NE, PU, SW, TO, CW <sup>**</sup>	0845
24	1159	1215	S-SWF	4	1-	MC, PR, NE	
25	0852	0922	S-SWF	3	1	HH, NE, PU	
26	1154	1207	Slow S-SWF	3	1-	BE, PR	b1155
27	1738	1757	Slow S-SWF	3	1	AN, HU, MC	
27	1759	1832	Slow S-SWF	5	1-	BE, HU, MC, PR, CR	
28	0026	0051	S-SWF	4	1	CS, TO	
28	0108	0148	S-SWF	4	2	CS, TO	
28	0708	0728	S-SWF	5	2-	OK, NE, TO, CW <sup>***</sup>	0700
28	1227	1250	Slow S-SWF	5	1+	BE, MC, PR, NE	1223
29	1343	1403	Slow S-SWF	3	1	MC, PR	1345
30	1233	1240	Slow S-SWF	3	1-	MC, PR	

CR = Cornell University, N.Y.

CS = Canberra, Australia.

DA = Darmstadt, Germany.

HH = Heinrich Hertz Institute, Berlin.

LI = Lindau, Germany.

MA = Madrid, Spain.

NE = Nederhorst den Berg, Netherlands.

PH = Pruhonice, Czech.

PO = Potsdam, Germany.

PU = Prague, Czech.

SW = Enkoping, Sweden.

TH = The Hague, Netherlands.

TO = Hiraiso Radio Wave Observatory, Japan.

CW<sup>\*</sup> = Cable and Wireless, Barbadoes.CW<sup>\*\*</sup> = Cable and Wireless, Somerton, England.CW<sup>\*\*\*</sup> = Cable and Wireless, Brentwood, England.CW<sup>+</sup> = Cable and Wireless, Hongkong.RCA<sup>\*</sup> = RCA Communications, Inc., Riverhead, N.Y.RCA<sup>+</sup> = RCA Communications, Inc., Pt. Reyes, Calif.

SOLAR RADIO EMISSION  
OUTSTANDING OCCURRENCES  
JULY 1957

OTTAWA

2800 MC

July 1957	Type *	Start UT Hrs:Mins	Duration Hrs:Mins	Maximum		Remarks
				Time UT Hrs:Mins	Peak Flux	
1	1 Simple 1	17 43	4	17 45	5	
1	1 Simple 1	19 34	4	19 36	5	
1	3 Simple 3f	19 51.5	45	20 00.5	26	
1	2 Simple 2	23 03.2	9	23 04.7	48	
1	7 Period Irreg. Act.	23 21	4.5	23 24	9	
1	2 Simple 2f	24 15	6	24 17	180	in sunset osc. in sunrise osc.
2	6 Complex	10 23.5	2	10 24	18	
2	7 Period Irreg. Act.	17 35	1	18 05.3	15	
2	6 Complex	21 30.7	5	21 32.5	35	
3	1 Simple 1	12 55	2.5	12 56	5	
3	7 Period Irreg. Act.	16 07	16	16 08.7	7	
3	2 Simple 2	22 32.5	1.5	22 33	24	
4	2 Simple 2	14 24.7	4	14 25.9	20	
4	Post		50		6	
4	6 Complex	20 45	7	20 46	7	
5	1 Simple 1	12 38.2	1	12 38.5	7	
5	1 Simple 1	14 21.5	3	14 22.7	6	
7	2 Simple 2	20 04.5	4.5	20 06	14	
8	3 Simple 3	16 18	22	16 24	7	
8	3 Simple 3	18 52	13	18 55.5	10	
8	3 Simple 3	19 42	15	19 45	7	
9	1 Simple 1	12 27	6	12 28.5	6	
9	2 Simple 2	17 46.5	1	17 47	27	
9	2 Simple 2	19 03	8	19 05	12	
13	1 Simple 1	16 50.9	0.2	16 51	7	
14	8 Group (2)	16 30	4.3			
	1 Simple 1	16 30	1	16 30.5	6	
	1 Simple 1	16 32.8	1.5	16 33.4	7	
15	1 Simple 1	11 43.6	1.5	11 43.9	7	
15	2 Simple 2	19 22.5	3	19 23.4	16	
15	9 Precursor f					
	6 Complex f	20 19	1	20 43	300	
	4 Post Increase A		>3		30	
16	2 Simple 2	23 04.2	0.7	23 04.3	9	
	6 Complex f	17 39	32	17 57.3	350	
	4 Post Increase A		3			
17	2 Simple 2 f	18 16	9	18 18.6	73	
17	2 Simple 2 A	12 19	2.5	12 19.9	72	
18	2 Simple 2	12 20.2	0.2	12 20.3	60	
18	6 Complex	11 08	3	11 08.4	24	
18	6 Complex f	12 47.7	5.5	12 50.5	37	
18	4 Post Increase		14		6	
18	6 Complex	21 37.3	6	21 39.8	17	
18	3 Simple 3	22 48	>1	22 58	14	
19	6 Complex	15 35	8	15 35.8	42	
19	1 Simple 1	23 47	2	23 47.5	7	
20	6 Complex	14 06.3	12	14 12.2	58	
	4 Post Increase A		42		8	
20	1 Simple 1	14 40.5	1.5	14 41	7	
20	6 Complex f	17 34.5	37.5	17 50.5	145	
	4 Post Increase		1			
20	1 Simple 1	22 10.7	1	22 11	15	
20	6 Complex	24 12.5	>20	24 17	7	
21	3 Simple 3 A	12 10	2 05	12 55	132	In sunset osc.
	8 Group (3)	13 21.5	35		10	

\* See page 6.

SOLAR RADIO EMISSION  
OUTSTANDING OCCURRENCES

JULY 1957

OTTAWA

2800 MC

July 1957	Type *	Start UT Hrs:Mins	Duration Hrs:Mins	Maximum		Remarks
				Time UT Hrs:Mins	Peak Flux	
21	6 Complex	13 21.5	6.5	13 22.5	23	
	9 Precursor f	13 29.5	5		35	
	2 Simple 2 f	13 34.5	8	13 35.9	850	
	6 Complex	13 51	5.5	13 52	14	
21	2 Simple 2	15 06	3	15 06.5	29	
21	2 Simple 2	17 42.7	5	17 43.3	165	
21	2 Simple 2	18 19	3	18 19.5	36	
21	3 Simple 3 A	19 23	50	19 50	8	
	1 Simple 1	19 24.5	2.5	19 25	7	
21	1 Simple 1	20 32	2	20 32.6	7	
21	2 Simple 2	21 36.1	3	21 36.5	20	
21	3 Simple 3	21 45	13	21 51.5	8	
21	6 Complex	22 43.3	5	22 43.7	32	
22	8 Group (4)	12 06.8	17.7			
	2 Simple 2	12 06.8	3	12 08	50	
	2 Simple 2	12 11.8	5	12 13	20	
	1 Simple 1	12 20	2	12 21.5	7	
	1 Simple 1	12 22.5	2	12 23.2	5	
22	3 Simple 3 A	12 39	3 30	indet.	15	
	8 Group (2)	12 58.5	43.5			
	2 Simple 2	12 58.5	3	13 00	12	
	2 Simple 2 A	13 04	8	13 08	53	
	4 Post Increase		30		12	
22	2 Simple 2	13 06.7	0.3	13 06.8	125	
	1 Simple 1	21 15.5	2	21 16.7	7	
22	2 Simple 2	22 26	4	22 26.7	100	
22	2 Simple 2	23 02.5	3.5	23 04.9	57	
	4 Post Increase		15		10	
22	6 Complex	23 44.5	6	23 45.6	44	
	4 Post Increase		20		14	
23	3 Simple 3	20 28	1 30	20 41.5	15	
24	Great Burst	16 28	4 50	16 45	15	
				17 36.8	175	
				18 10.5	630	
				18 38.5	1080	
25	8 Group (2)	12 45	17			
	2 Simple 2	12 45	2	12 46	9	
	9 Precursor	12 55	1		3	
	2 Simple 2 f	12 56	6	12 56.7	50	
25	3 Simple 3	20 45	10	20 49.5	14	
25	3 Simple 3 A	21 43	30	21 55.5	7	
	1 Simple 1	21 51	2	21 51.5	7	
26	1 Simple 1	16 00	2	16 00.5	6	
27	3 Simple 3	13 21	10	13 21.5	3	
27	1 Simple 1	15 28.3	2.5	15 29.2	7	
27	3 Simple 3	17 40	15	17 48	4	
27	1 Simple 1	18 55.5	3	18 57	6	
27	3 Simple 3	20 55	25	21 06	6	
27	3 Simple 3 A	21 31	27	21 33	8	
	2 Simple 2 f	21 34.5	3.5	21 35.5	15	
28	2 Simple 2	13 53.2	4	13 54.1	18	
28	2 Simple 2	14 09.5	4	14 11.3	14	
28	3 Simple 3	16 49.5	25	16 52	11	
28	3 Simple 3	17 30	10	17 32	6	
29	2 Simple 2	15 27.7	1	15 28	9	
29	1 Simple 1	15 32	3	15 33.5	5	
31	3 Simple 3	22 21	12	22 25	5	

\* See page 6.

## SOLAR RADIO EMISSION

## DAILY DATA

JULY 1957

CORNELL

200 MC

July 1957	Flux Density in terms of KTB			Variability 0 to 3 Hours UT			Observing Periods Hours UT
	Hours UT			12	15	18	
	12	15	18	15	18	21	
1	[2.85	2.85	2.40]	[2	2	2]	1255-2005
2	[29.4	30.7	17.5]	[2	2	2]	1300-2005
3	[18.1	5.65	4.50]	[2	1	1]	1240-2015
4	[2.90	4.85	4.80]	[2	2	2]	1240-2005
5	[1.50	1.75	1.80]	[2	1	2]	1245-2010
6	[3.00	3.10	2.50]	[3	3	2]	1235-2000
7	[1.40	1.45	1.40]	[1	1	L*]	1235-2105
8							
9	[1.40	1.40]		[1	1		1550-2020
10	[1.40	1.40	1.40]	[0	0	1]	1250-1955
11	[1.40	1.40	1.40]	[0	0	0]	1240-2010
12	[1.40	1.45	1.60]	[0	1	1]	1245-2045
13	[1.40	1.45	1.40]	[0	1	1]	1245-2000
14							
15	[1.60	1.40	1.40]]	[1	0	1]]	1230-1430, 1445-1510, 1535-1850
16	[1.40	1.40	1.70]	[1	0	1]	1250-2025
17	[1.60	1.75	1.75]	[1	1	1]	1240-2015
18	[1.45	1.55	1.70]	[1	1	1]	1245-2015
19	[1.40	1.40	1.40]	[0	0	0]	1255-2000
20	[1.45	1.65	1.75]		1	1]	1235-2025
21	[2.25	2.10	2.55]	[1	1	2]	1415-2000
22	[1.45	1.50	1.50]	[1	1	1]	1250-1340, 1425-1515, 1530-2030
23	[2.25	2.30	2.20]	[1	2	2]	1305-2000
24	[3.30	3.35	8.30]	[2	2	2]	1250-1945
25	[3.35	3.65	3.50]	[2	2	2]	1245-2010
26	[1.40	1.40	1.40]	[2	2	2]	1240-2030
27	[1.90	1.40	1.40]	[1	0	L*]	1210-2015
28	[1.40	1.40	1.40]	[0	0	0]	1220-2000
29	[1.60	1.90	1.85]	[L*	1	1]	1250-2000
30		2.55	2.60]		1	1]	1535-2015
31	[1.40	1.50	1.40]]	[0	1	0]]	1250-1905

[ = first hour missing.

[[ = first two hours missing.

]] = last two hours missing.

] = last hour missing.

\* = Lightning.

Quiet sun = 1.40 KTB.

SOLAR RADIO EMISSION  
OUTSTANDING OCCURRENCES

JULY 1957

CORNELL

200 MC

July 1957	Type Ap.J	Start UT	Time Max. UT	Duration Min.	Type IAU	Max. Flux Density in terms of KTB		Remarks
						Inst.	Smooth	
3	3	1621	1621.5	5	ECD	>44.8	>29.6	
9	3	1655.5	1656	1.5	ECD	>9.90	>7.75	
	3	1722	1723	2	ECD	8.00	5.30	
10	3	1812.5	1813	1	ECD	6.70	4.35	
11	2	1506	1507.5	5	CD	>9.90	5.40	
16	8	1753		54	CD	>9.90	>7.75	off-scale 1802-07 1808-09 1813.5-20
21	3	1534.5	1535	1	ECA	>9.90	>6.20	
	3	1628.5	1629	.5	ECA	>9.90	>6.00	
	3	1704	1704.5	1	ECA	>9.90	>5.80	
	8	1742		8	CD	>9.90	>5.30	off-scale 1743-44 1746.5-47
22	3	1905.5		1	ECA	>9.90	>5.30	
	3	1331.5		3	ECA	>9.90	>7.75	off-scale 1332-33.5
	3	1536	1537.5	2	ECA	>9.90	>7.75	
	2	1555		4	CA	>9.90	>7.75	off-scale 1556 1558-58.5
	3	1605	1605.5	1	CA	>9.90	>7.75	
	3	1657	1657.5	1	CA	>9.90	>7.75	
	3	1928.5		1	CA	>9.90	>7.60	
23	3	1652		2	CA	>9.90	>7.00	off-scale 1652.5-53
24	8	1812		35	ECD	>44.8	16.8	off-scale 1813-1819
27	7	1212.5		100	E			
29	3	1711.5		2	ECD	>9.9	>7.6	
31	1	1437		159	EF			

SOLAR RADIO EMISSION  
DAILY DATA ( FLUX )  
JULY 1957

BOULDER

167 MC

	Flux Density					Variability					Observing Periods		
	$10^{-22} \text{ w m}^{-2} (\text{c/s})^{-1}$					0 to 3							
	Hours UT					Hours UT					Hours UT		
July 1957	0 3	12 15	15 18	18 21	21 24	Day	0 3	12 15	15 18	18 21	21 24	Day	
1	62	69	265			130		1	1	1S	2S	1S	11.6-14.8,16.9-02.3
2	1480	640				1180	2S	3	3	3		3	11.6-13.0,13.6-19.5
3													
4													
5													
6	60	67	46	32		50	2	2S	3	3	3	3	00.5-02.3,11.7-02.3
7	28	21	16	18		20	3	1	2	1S	OS	1	11.7-12.5,13.3-02.3
8	11	11	11			11	OS	OS	1S	OS	OS	OS	11.7-13.0,13.6-02.3
9	13	12	14	14		13	OS	2	2	2S	1S	2S	11.7-02.2
10	14	15	14	14		14	1S	OS	OS	OS	OS	OS	11.7-02.2
11	14	13	14	15		14	OS	OS	1S	OS	OS	OS	11.7-23.1
12		15	15			14	OS	OS		OS	OS	OS	11.7-16.2,18.1-02.2
13	13	14	13	14		13	OS	1S	1S	OS	OS	1S	11.8-02.2
14	16	16	21	31		22	OS	2S	1S	1S	1S	1S	11.8-02.2
15	14	14	14	14		14	1S	1S	OS	1S	2S	1S	11.8-02.2
16	12	12	21	12		14		OS	2S	3	1S	2S	11.8-02.2
17	17	19	14	15		16	1S	2S	2S	2S	OS	2S	11.8-02.2
18		18	14	17		16	OS		1S	OS	2S	1S	15.0-02.1
19		10	11	10		10	2S		2S	OS	OS	OS	15.5-02.1
20	11	11				11	OS	2S	OS			1S	11.8-16.5
21				23						2S	2S		22.0-16.5
22	12	13	13	14		13	2S	2S	3	2S	3	3	11.8-02.0
23	34	31	21	34		29	3	2S	2S	1S	2S	2S	11.8-02.0
24		48	87	50		60	2S	2	2S	3	2S	2S	13.6-02.0
25	57	66	68	76		68	2S	3	2S	2S	2S	2S	11.8-02.0
26	15	14	14	13		14	2S	1S	2S	1S	OS	1S	11.9-02.0
27	13	13	13	12		13	OS	2S	OS	1S	OS	1S	11.9-02.0
28	14	14				14	OS	1S	OS			1S	11.9-16.5
29				45						2S		2S	22.0-01.9
30	42	35	34	35		36	2S	1S	2S	1S	2S	2S	12.0-01.9
31	11	14				12	2S	OS	2S			1S	12.0-17.4

SOLAR RADIO EMISSION  
OUTSTANDING OCCURRENCES  
JULY 1957

BOULDER

167 MC

Date July	Type Ap.J	Start UT	Time of Maximum	Duration Minutes	Type IAU	Max. Flux Density $10^{-22} \text{ w m}^{-2} (\text{c/s})^{-1}$		Remarks
						Inst.	Smooth	
1	6	1135 B	0030 X	880 D	CA		320	I 1445-1655
1	3	2100.8	2100.9	0.2	ESD	3600 D		
1	8	2249 X	2253.8	6 X	CD	4400 D	740	
1	3	2335.3	2335.9	1	SD	7200 D		
2	6	1135 B	1516.1	475 D	CA	7800 D	1700	I 1300-1337, N2
6	6	0027 B	0144.4	108	CA	150 X	12 X	
6	6	1140 B	1215.9	875 D	CA	2000 X	25 X	I 1300-1317, N3
7	6	1140 B	1747.2	400	CA	240	16	I 1231-1318, S 1930-0215, N4
9	3	1320.8	1321.8	1.1	ECD	460		Large bursts 1439.5, 1510.7
9	8	1655.3	1656.1	1.6	ECD	3300 D	910	S 1545-0410
11	2	1507.1	1508.1	3	CD	290		S 1140-2305
14	1	1145 B	1428	405	M	180		S 1145-1830
14	3	1307.6	1307.7	0.1	ESD	840		Large burst 1759.6
14	6	1830	2341	460 D	CA	1100	21	S 1845-0210
15	1	1300	2308.9	630 X	M	100		S 1320-0410
15	0	2016 X	2036	31 I	CD	60	25	
16	9	1753.5	1818.0	32 X	ECD	1700	470	
17	3	0113.9	0114.0	2.0	ECD	1200	470	S 0015-0210
17	1	1145 B	1758.8	865 D	M	1400		S 1145-0210
17	8	1217.9	1218.1	3.4	ECD	2200 X	560 X	
17	3	1350.8	1351.2	0.6	ESD	4100 D		
18	1	1500 B	0119	665 D	M	2000		S 1730-2000, Max. July 19
18	8	2247 X	2253.5	9 X	CD	320	170	
19	2	1535.1	1538.1	9.7	EFD	310	49	S 1730-0205
20	2	1351.8	1354.0	3.6	ECD	220	88	S 1145-1430
21	1	2200 B	2213.0	245 D	M	4400 D		S 2200-0205
22	1	1145 B	2158.7	855 D	MC	9500 D		S 1930-0200
22	8	1554.5	1555.8	4.3	EFD	6400 D	480	Large bursts 2128.9, 2212.2
22	8	2235.4	2237.8	2.6	EFD	4900 D	470	
23	8	0040.7	0041.1	1.9	ECD	6500 D	1300	
23	6	1150 B	2300 X	850 D	CA	900	24	S 1325-0200
24	6	1338 B	1730 X	742 D	CA		81	S 1900-0200
24	9	1810 X	1832 X	39 I	CD	1000	380	
24	0	2000 X	2002	16 X	CD	310	55	
25	6	1150 B	1647.5	850 D	CA	1200	66	S 1645-0200
26	1	1155 B	1605.2	845 D	M	200		S 1425-0200
26	8	1559.9	1600.6	1.0	ECD	6800 D		
27	1	1155 B	1320.1	95	M	200		S 1155-0200
27	2	1211.7	1213.0	2.3	ECD	1700 X	330 X	
29	6	2200 B	2208.0	235	CA	290	35	S 2200-0155
29	3	2350.5	2350.8	0.2	CD	950		
30	6	1200 B	2021.0	835 D	CA	1800	31	S 2000-0155
30	3	2145.9	2145.9	0.4	ESD	2600 D		
31	2	1703.4	1705.6	6.0	CD	450	95	S 1200-1500

## Notes:

1. Interference may sometimes obscure or be mistaken for solar events.
2. July 2, large bursts at 1531.8, 1752.0, 1821.8 and 1902.4.
3. July 6, large bursts at 1155.9, 1326.4, 1210.9, 1841.4 and 1908.7.
4. July 7, large bursts at 1204.5 and 1735.4.

SOLAR RADIO EMISSION  
DAILY DATA ( FLUX )  
JULY 1957

BOULDER

450 MC

July 1957	Flux Density					Variability					Observing Periods	
	$10^{-22} \text{ w m}^{-2} (\text{c/s})^{-1}$					0 to 3					Hours UT	Hours UT
	Hours UT					Hours UT						
0	12	15	18	21	Day	0	12	15	18	21	Day	
3	15	18	21	24		3	15	18	21	24		
1		61	67	63		0S	0S	0	0	0S	11.5-02.3	
2	94	66	70	84		0	1	1	1	1	13.6-02.3	
3	63	61	62	62		1	2	2	0S	0	1	11.6-02.3
4	63	63	62	62		0	0	0	0	0	0	11.6-02.3
5	74	60	64	67		0	1	0	0	0	0	11.6-02.3
6		56	54	58	56	0	0	0	0	0	0	13.2-02.3
7	61	58	57	62	59	0S	0	0	0S	0S	0S	13.3-02.3
8						0						
9												
10				69						0	0	21.3-02.2
11	64	60	59	61		0	0	0	0	0	0	11.7-16.6, 21.6-02.2
12	70	58	67	64		0S	1	1	0	1	1	11.7-14.8, 15.7-02.2
13	67	63	59	63		1S	0	0	0	0	0	11.7-02.2
14	68	61	59	66		0S	1	0	0	0S	0	11.7-02.2
15	80					0S	0					11.7-15.2
16												
17												
18												
19		57X	57X	62X	60X				0	0	0	18.7-02.1
20	51X	48X	50X	57X	51X	0S	1	0	0	0	0	11.8-02.1
21	158	127X	70	113X		0S	3	2	3	3	3	11.8-19.1, 22.0-02.1
22	55X	48X	71X	71X	61X	2	3	2	1	2	2	11.8-18.5, 19.5-02.1
23	62	61	57	62	60	0S	0	0	0	0	0	11.8-02.0
24	70	60	146	66	87	0	0	0	2	0	1	11.8-02.0
25	72	65	62	69	66	0	1	0	0	0	0	11.8-21.3, 22.3-02.0
26	70	58	55	62	61	0	0	0	0	0	0	11.8-02.0
27	70	58	54	57	59	0	0	0	1	0	0	11.8-01.9
28	61	54	51	54	54	0	0	0	0	0	0	11.9-01.9
29	57	54	48	55	53	0	0	0	0	0	0	11.9-01.9
30	69	62	60	65	64	0	0	0	0S	0	0	11.9-17.0, 18.8-01.9
31	66	59	55	59	59	0	0	1	0	0	0	11.9-02.9

## SOLAR RADIO EMISSION

## OUTSTANDING OCCURRENCES

JULY 1957

BOULDER

450 MC

Date July	Type Ap.J	Start UT	Time of Maximum	Duration Minutes	Type IAU	Max. Flux Density $10^{-22} \text{ w m}^{-2} (\text{c/s})^{-1}$		Remarks
						Inst.	Smooth	
2	6	1338 B	1500 X	747 D	CA		65	
3	2	1255.3	1255.4	2.2	ECD	85		N2
3	2	1620.8	1621.0	10	EFD	200		N3
3	2	1755.3	1756.2	1.5	ECD	860		
5	3	1233.7	1233.9	0.3	ESD	230		
12	3	2251.2	2251.3	0.2	ESD	610		
13	2	0057.8	0057.7	1.3	ECD	590		
14	2	1322 B	1322	1	CD	260		I 1318-1322
21	2	1328	1330.5	8 I	ECD	1300 X		
21	9A	1336	1338.9	6	ESD	57000 D	37000 D	N4
21	9B	1342	1355.7	16	CD	33000 D	11000 D	
21	9	1411	1428.6	32 I	CD	27000 D	21000 D	
21	9	1445	1459.2	44	ECD	29000 D	10000 D	
21	8	2211	2214.1	5	CD	1100 X	550 X	
21	9	2228	2243.4	24 I	CD	26000 D	1500 X	
21	0	2303	2306.6	10	CD	260 X	100 X	
21	8	2309	2311.7	6	ECD	12000 D	1100 X	
21	3	0034 B	0034.1	1 I	CD	1000 X		
22	8	0047.6	0048.4	3.0	ECD	2600 X		480 X
22	2	0138.9	0140.1	2.8	EFD	2000 X		
22	3	1207.3	1208.1	1.3	CD	5700 D		
22	8	1222.5	1223.1	2.1	ESD	23000 D	10000 D	N4
22	1	1359	1547.9	587	MCD	1600 X		N5
24	9	1803	1830.8	74 X	CD	1700	260	
25	2	1256.2	1256.4	8	ECD	450		
27	2	1855.2	1856.9	2.7	FD	170	26	
30	3	1838.8	1838.9	0.3	ESD	430		May be S
31	3	1622.9	1623.0	0.2	ESD	240		May be S
31	3	1738.2	1738.2	0.2	ESD	240		May be S

Notes: 1. Occurrences having a flux density less than twice the median level are not reported.

2. July 2. Large burst at 1821.9, flux density 520. Other large bursts at 2249.2 and 2419.8.

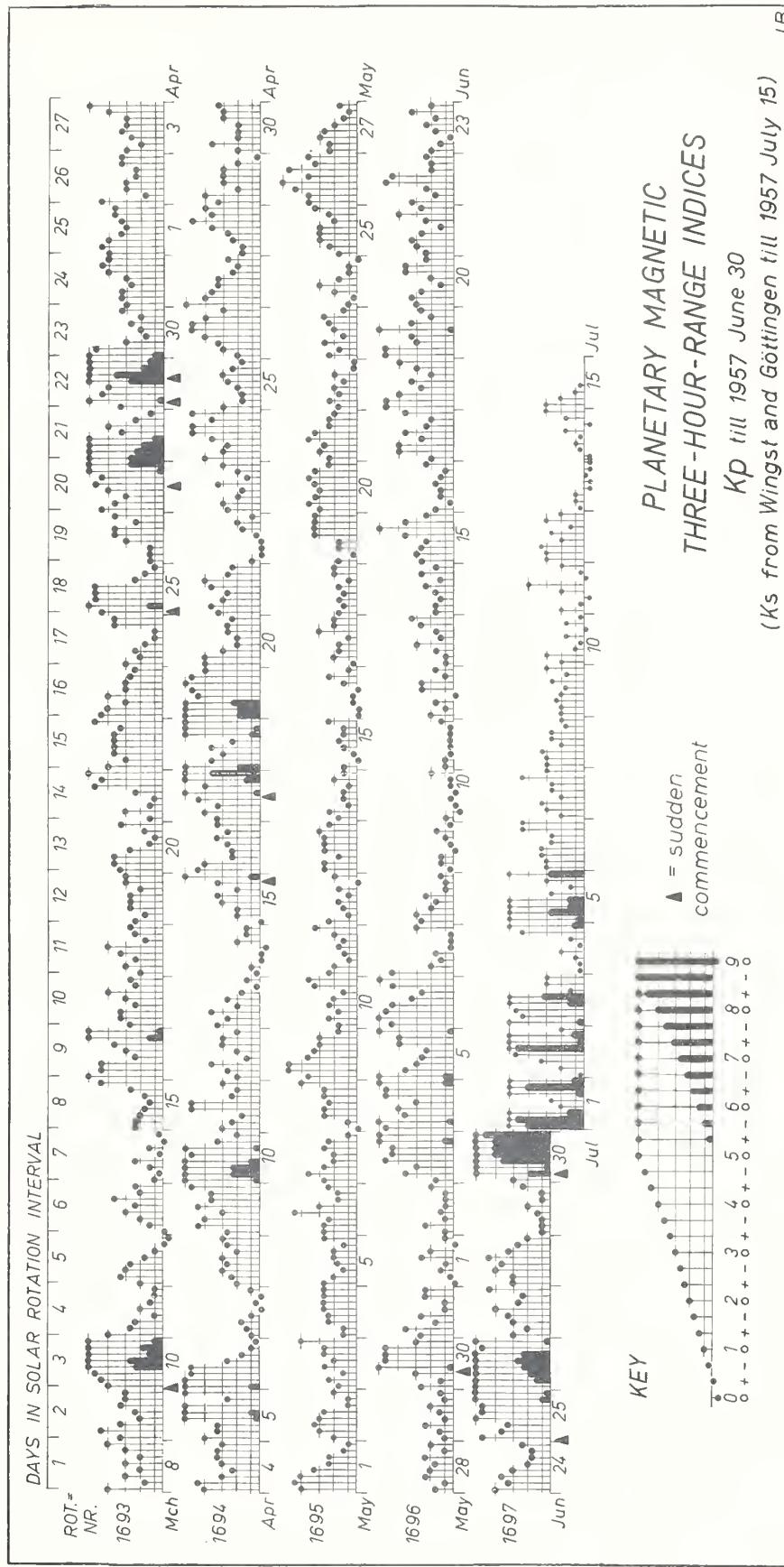
3. Other large burst 0123.9.

4. On July 21 and 22, the receiver sensitivity was so low that much higher than normal flux densities could be recorded. The maximum calibrated flux density is about 5000. Greater flux densities represent a linear extrapolation from the end of the calibrated range which is a lower limit for the actual flux densities. Therefore the occurrences recorded on July 21 and 22 are by far the largest ones we have observed.

5. July 22. Other large bursts at 2226.1 and 2344.3.

GEOMAGNETIC ACTIVITY INDICES  
JUNE 1957

June 1957	C	Values Kp								Sum	Ap	Final Selected Days	
		Three hour Gr. interval				1	2	3	4	5	6	7	8
1	0.2	0+	1-	1+	1o	3-	2o	0+	1o	9+	5	Five	
2	0.2	1o	2+	1o	1+	1o	1o	1o	2o	11-	5	Quiet	
3	1.3	2-	4-	3o	5-	4+	4+	6-	5o	32+	33		
4	1.3	5-	5+	4-	4o	3o	5-	5-	6-	36-	38	1	
5	1.1	6-	4-	3o	3-	2+	4o	4o	5+	31-	29	2	
												9	
6	1.2	4+	5o	5-	4+	3+	3-	4+	5o	34-	33	10	
7	0.6	4+	2o	1+	2-	1-	1-	1-	3o	14+	9	11	
8	0.3	3-	3o	2o	2-	2+	1o	1o	1+	15o	8		
9	0.2	1-	1+	1+	0+	1-	1o	2-	1-	8-	4		
10	0.0	1o	0o	0+	1-	0+	1-	1-	2o	6-	3		
11	0.1	1o	1o	1-	1-	1-	1-	1-	1+	7-	4	Five	
12	0.2	2o	1o	2-	0+	3-	3-	1o	2-	13o	7	Disturbed	
13	0.5	1o	1o	2-	3o	1+	2-	3-	3+	16-	9		
14	0.4	2-	2-	1+	2-	2+	1+	3-	2-	14+	7	4	
15	0.9	3-	3o	3-	2+	4-	5o	4-	2+	25+	19	6	
												25	
16	0.2	2-	1-	1+	1+	2-	1+	1o	2+	11+	5	26	
17	0.9	2o	4o	4o	3-	4-	2+	2o	4-	24+	17	30	
18	1.1	5-	5-	4o	3-	3+	2o	3o	4o	28+	23		
19	1.0	5-	5-	3o	3+	5+	3+	2o	3-	29o	25		
20	0.8	3o	3+	3-	1+	2o	4-	4-	2+	22o	14		
21	0.8	2+	3o	3+	3-	1+	2+	4o	3-	22-	13	Ten	
22	0.9	3+	2-	2+	5-	4+	2o	2o	2+	23-	16	Quiet	
23	0.4	2o	1+	1-	2-	2+	2-	3+	2o	15o	8		
24	0.9	4o	3+	4-	3o	2o	2-	2-	2+	22-	14	1	
25	1.5	5-	4-	3+	5o	5-	5-	6-	5+	37o	41	2	
												3	
26	1.7	5o	6o	6+	7-	7o	7-	5-	5+	48-	84	9	
27	1.0	3o	2o	3o	3+	4o	3-	2+	4+	25-	17	10	
28	1.0	3o	3o	4o	4-	4+	3+	3-	2o	26o	18	11	
29	0.1	1o	1o	1o	1+	2o	1o	1o	2+	11-	5	12	
30	2.0	3o	6+	5+	3-	8o	8o	8o	8+	55-	150	14	
												16	
Mean		0.76								Mean:	22.1	29	



## CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

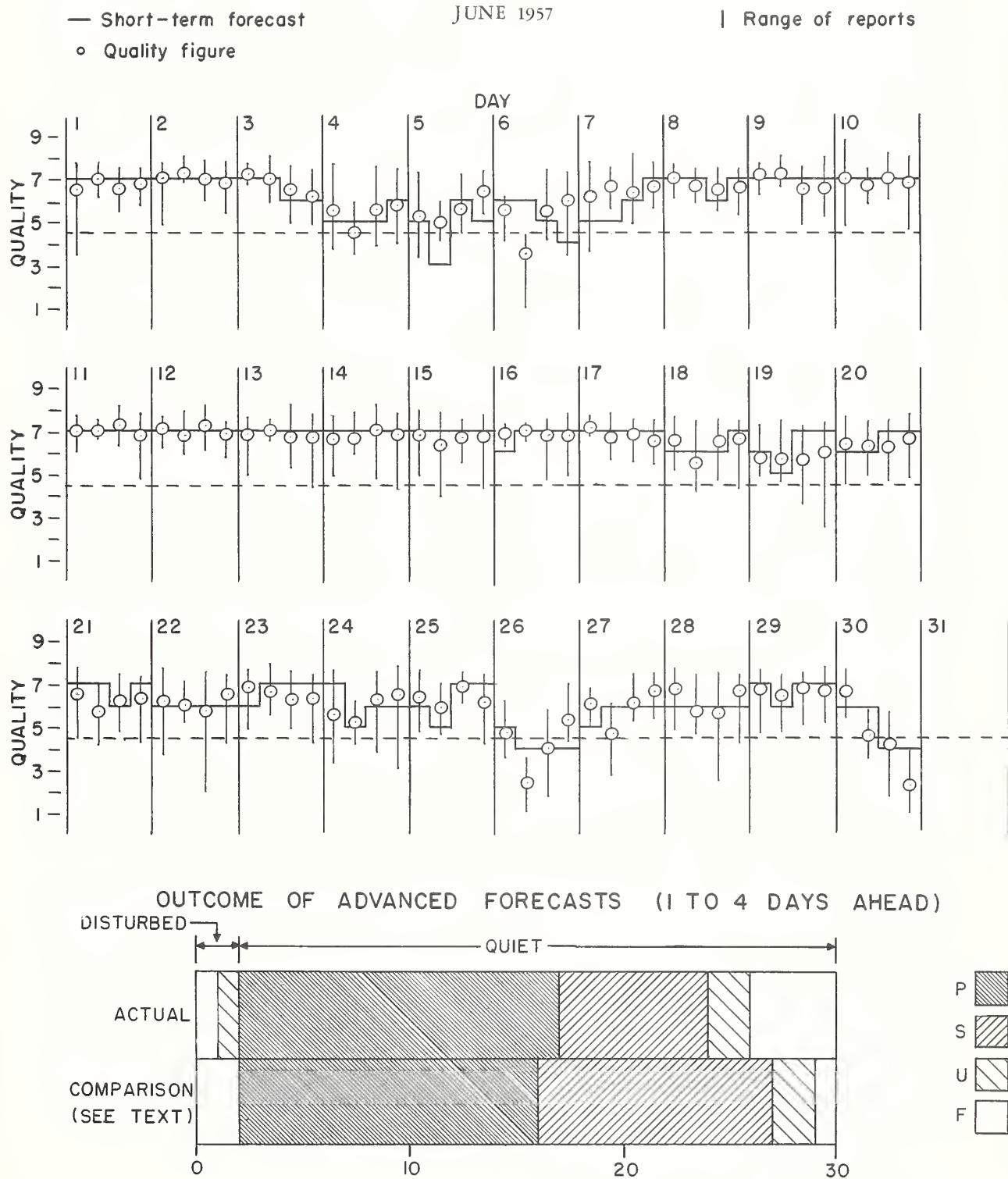
## NORTH ATLANTIC

JUNE 1957

June 1957	North Atlantic 6-hourly quality figures	Short-term forecasts issued about one hour in advance of:				Whole day index	Advance forecasts (J-reports) for whole day; issued in advance by:			Geomag- netic KFr	
		00	06	12	18		00	06	12	18	
		to 06	to 12	to 18	to 24		to 06	to 12	to 18	to 24	(1)
1	7- 7o 7- 7-			7	7	7	7				1 2
2	7o 7+ 7o 7-			7	7	7	7				1 2
3	7+ 7o 7- 6+			7	7	6	6				3 (5)
4	6- 4+ 6- 6-			5	5	5	6				(4) (4)
5	5+ 5o 6- 6+			5	3	6	5				(4) 3
6	6- 3+ 6- 6o			6	6	5	4				(5) (4)
7	6+ 7- 6+ 7-			5	5	6	7				2 2
8	7o 7- 7- 7-			7	7	6	7				3 2
9	7+ 7+ 7- 7-			7	7	7	7				1 2
10	7o 7- 7o 7o			7	7	7	7				1 1
11	7o 7o 7+ 7-			7	7	7	7				1 2
12	7o 7- 7+ 7o			7	7	7	7				2 2
13	7o 7o 7- 7-			7	7	7	7				2 3
14	7- 7- 7o 7-			7	7	7	7				2 2
15	7o 6+ 7- 7-			7	7	7	7				2 3
16	7o 7o 7- 7-			6	7	7	7				1 2
17	7o 7- 7o 7-			7	7	7	7				3 3
18	7- 6- 7- 7-			6	6	6	7				(4) 3
19	6- 6- 6- 6o			6	5	7	7				(4) 3
20	6+ 6+ 6+ 7-			6	6	7	7				3 3
21	7- 6- 6+ 6+			7	7	6	7				3 3
22	6+ 6o 6o 7-			6	6	6	6				3 3
23	7- 7- 6+ 6+			6	7	7	7				2 3
24	6- 5+ 6+ 7-			7	5	6	6				3 2
25	6+ 6o 7o 6+			6	5	7	7				(4) (5)
26	5- 2+ 4o 5+			5	4	4	4				(5) (6)
27	6o 5- 6+ 7-			5	6	6	6				3 (4)
28	7- 6o 6- 7-			6	6	6	6				3 3
29	7- 6+ 7- 7-			7	6	7	7				2 2
30	7- 5- 4+ 2+			6	6	4	4				(6) (7)
Score: Quiet Periods		P	21	19	20	18			15	14	
		S	9	6	8	10			7	10	
		U	0	2	0	0			2	3	
		F	0	0	0	1			4	1	
Disturbed Periods		P	0	0	2-	0			0	0	
		S	0	1	0	0			1	0	
		U	0	1	0	1			0	0	
		F	0	1	0	0			1	2	

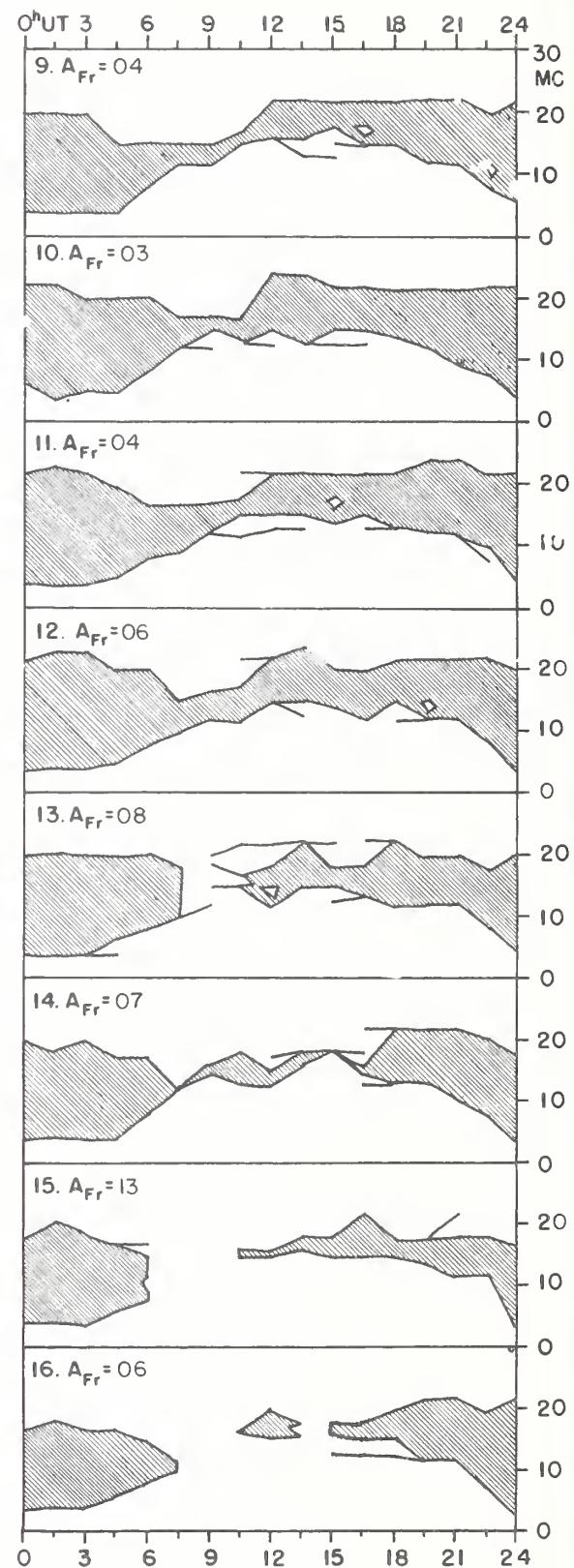
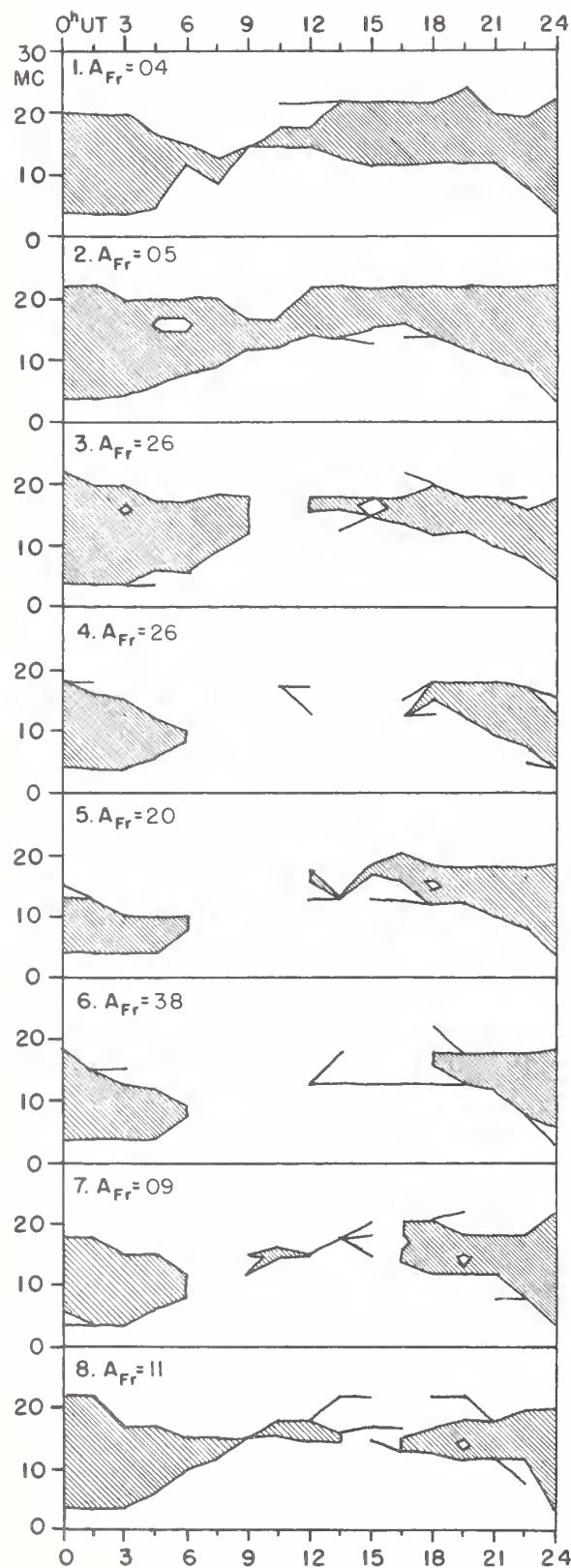
( ) represent disturbed values.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS  
NORTH ATLANTIC

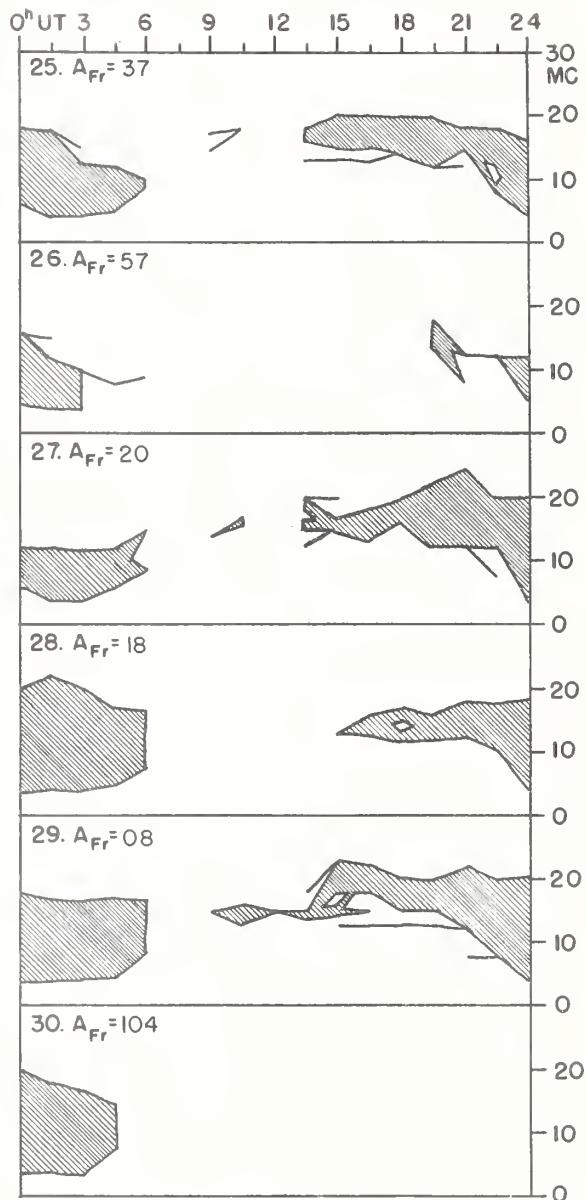
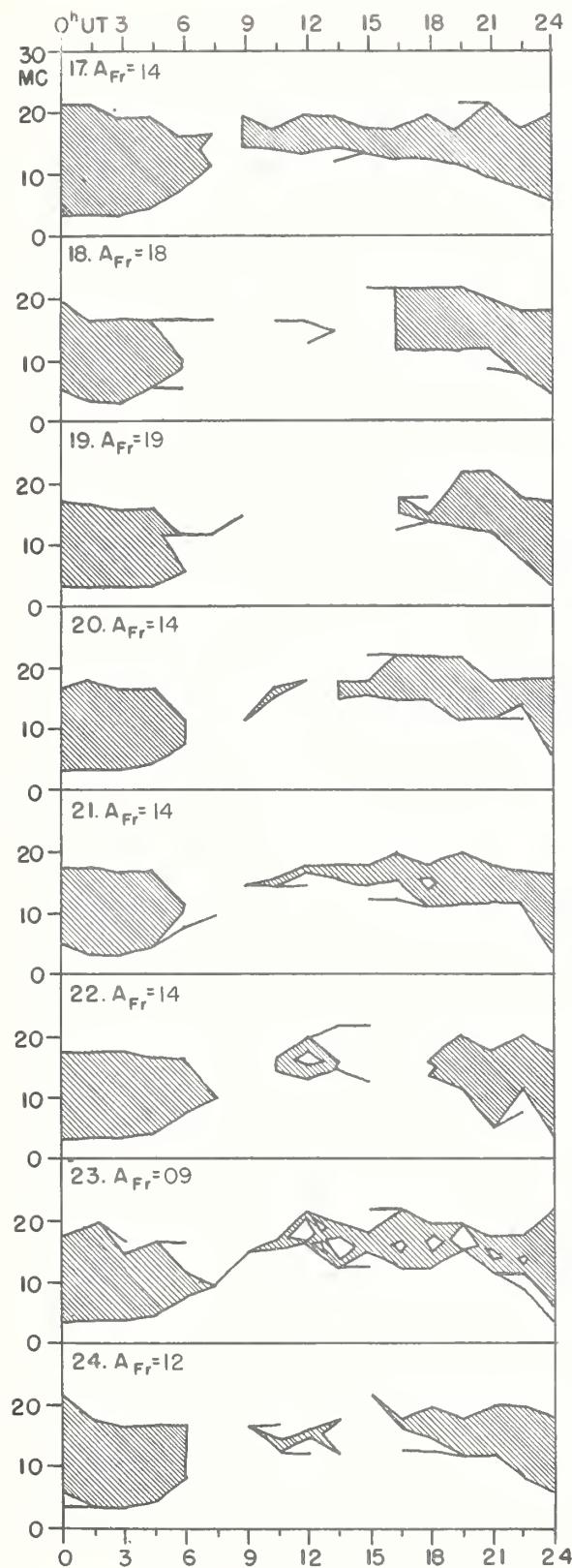


## USEFUL FREQUENCY RANGES -- NORTH ATLANTIC PATH

JUNE 1957



JUNE 1957



## CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS

## NORTH PACIFIC

JUNE 1957

June 1957	North Pacific 8-hourly quality figures	Short-term fore- casts issued at			Whole day index	Advance forecasts (Jp reports) for whole day; issued in advance by:			Geomag- netic KSi
		03 to 11	11 to 19	19 to 03		02	10	18	
1	7 7 6				6	7 7	7		2 2
2	6 6 6				6	6 7	7		2 1
3	6 6 6				6	7 7	7		(4) (4)
4	5 5 6				5	7 7	7		(5) (4)
5	5 6 6				5	5 7	7		(4) (4)
6	5 5 6				5	5 6	7		(6) (4)
7	6 6 6				6	6 7	7		(4) 1
8	6 6 6				6	6 6	6		(4) 2
9	6 6 6				6	6 7	7		1 1
10	6 7 6				6	6 7	7		0 1
11	6 6 6				6	6 6	6		1 0
12	6 6 6				6	6 6	6		1 2
13	6 6 5				6	6 7	7		2 2
14	5 6 6				6	6 7	7		2 2
15	5 6 6				6	6 6	6		3 3
16	6 5 6				6	6 6	5		1 1
17	6 6 6				6	6 6	6		3 3
18	5 6 6				6	6 6	6		(5) 3
19	5 5 6				5	6 6	6		(5) (4)
20	5 5 6				5	6 5	5		3 2
21	5 6 6				6	6 6	5		(4) 2
22	6 5 6				5	5 5	5		(4) 3
23	6 6 5				6	5 5	5		1 2
24	5 6 6				6	5 6	6		3 2
25	5 6 6				6	6 6	6		(4) (4)
26	3 2 5				(3)	5 6	6		(7) (6)
27	6 6 5				6	5 6	6		2 2
28	5 5 6				5	6 6	6		(4) 2
29	6 6 6				6	6 5	5		1 1
30	4 2 2				(3)	6 6	6		(6) (7)
Score: Quiet Periods		P	15	21	19		19	13	
		S	12	8	9		8	12	
		U	0	0	1		1	3	
		F	1	0	0		0	0	
Disturbed Periods		P	0	0	0		0	0	
		S	0	2	1		0	0	
		U	1	0	0		1	0	
		F	1	0	0		1	2	

( ) represent disturbed values.

CRPL RADIO PROPAGATION QUALITY FIGURES AND FORECASTS  
NORTH PACIFIC

JUNE 1957

